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Water Supply and Use

Dalton Lake, Georgia

Prepared for:

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WATER SUPPLY AND USE

DALTON LAKE, GEORGIA

Prepared by:

The Hydrologic Engineering Center

for:

U.S. Army Engineer District,
Mobile

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EXECUTIVE SUMMARY

Study Overview

Water supply and use in the Coosa River Basin, Georgia are examined to assess the availability of alternative supplies to the proposed Dalton Lake reservoir project. Streamflow records at 21 gage locations are analyzed to assess the availability of surface water. Withdrawal and discharge records at 364 locations throughout the basin are analyzed to determine water use. To show the relationship between supply and use, the basin is divided into ten hydrologic sub-units and data presented in a water balance. A detailed analysis is presented of the impact of withdrawing 51 MGD from the Coosawattee River near Carters and the role of Carters Reservoir on downstream releases. The above analyses were done using microcomputer hardware and software which greatly facilitated the computations and graphics, and which makes available, on diskettes, the supply and use data for future analyses.

Annual Water Supply

Surface water supply is examined in this study in several different ways: low-flow frequency, duration-probability, flow-duration analyses; drought duration, magnitude and severity; stochastic analysis; daily flows of record. Each analysis presents in a different way information on the availability of surface water supply. The 7Q10 streamflow was used as a reference flow because of its regulatory role in maintaining in-stream water quality. The 7Q10 is an average flow for seven consecutive days which has a probability of 0.10 of not being exceeded during any one year. It was found that the Coosa Basin streams are both a plentiful supply and susceptible to drought. Wet seasons and years provide a good supply source, however, storage is not available to store this supply so the region is also vulnerable to dry periods. An analysis of the principal droughts of record shows mean annual flows below the period of record mean annual flow for up to nine consecutive years at some stations.

Low-Flow Months Supply

The low-flow period in the Coosa Basin are the months of June through November. The June through November flow at several representative stations have below annual mean streamflow for the period of record, as expected. Low-flow frequency analyses indicate the probability of different magnitudes not being exceeded for different durations. At some gaging stations there is little difference in the magnitude of flow for seven consecutive dry days or thirty consecutive dry days. At other stations the difference is significant. Lower flows for longer durations mean more difficulty in meeting demand or more storage to supplement available supply.

Water Use

Withdrawal and discharge data are analyzed for the past five years, 1980-1984. This analysis shows that over 90 percent of the withdrawals in the basin are by six users (excluding Hammond Power Plant). Similarly, 80 percent of the discharge in the basin is by ten users. Consumptive use varies from zero to 86 percent depending upon the user. Withdrawal and discharge data vary from month to month and year to year. The monthly variation for 1984 is relatively small. The variation from year to year shows no consistent trend for most users. Some years are higher, others lower.

Water Balance

A comparison, by hydrologic sub-unit, of 1984 consumptive use shows that it is less than 6 percent of the minimum mean annual streamflow and less than 25 percent of the minimum mean September flow. The minimum annual and minimum September streamflows are the minimum of record. These minimum streamflows were also compared with the 7Q10 plus cumulative withdrawals for each hydrologic sub-unit. This showed that on an annual basis that 7Q10 plus withdrawals were less than 50 percent of the minimum annual flow for all sub-units except one where it was 66.6 percent. Examining September data the analysis showed that in seven sub-units the 7Q10 plus withdrawals exceeded the minimum September flow of record. Under this worse case situation withdrawals upstream may have to be reduced to provide for in-stream flow requirements.

Withdrawal at Carters

An alternative supply to Dalton Lake is withdrawal of surface water at Carters downstream from Carters Reservoir. An analysis of the 36-year historical record shows that there have been approximately 723 days when the streamflow in the Coosawattee River near Carters has fallen below 319 cfs which is the 7Q10 flow plus 79 cfs (51 MGD) estimated withdrawal. The probability of a low flow of 319 cfs or less lasting for a 7-day duration is approximately 0.38 when the water available in the stream is less than that needed for withdrawal. Both the magnitude and frequency of such an occurrence must be borne by the user. This is done in the selection of an appropriate backup strategy. In addition to magnitude and frequency, cost and desired level of reliability must be investigated.

INTRODUCTION

Study Purpose and Scope

This study investigates water supply and use in the Coosa River Basin, Georgia and the potential of withdrawal near Carters, Georgia as an alternative supply source to Dalton Lake. The study uses currently available water supply and use data from the U.S. Geological Survey as the principal source of data. The surface water supply in the basin is analyzed in several ways and the results presented. Municipal and industrial water use is analyzed for the past five years (1980-1984). A comparison of water supply and use is presented in a water balance for the basin. This balance provides an assessment of the relationship between minimum streamflow of record and 1984 water use. Given the analyses of supply and usage described above, an alternative supply to the Corps of Engineers proposed Dalton Lake project is investigated. This alternative is necessary to compute water supply benefits for Dalton Lake as defined by the "most likely alternative" method. This report covers an assessment of the hydrologic availability of supply for possible withdrawal near Carters. An estimate of the cost of this alternative, including location and size of required facilities, is being made by the Mobile District, Corps of Engineers.

The text of the report discusses the analyses and principal findings of each major topic covered. Appendices A through H contain more detailed information. The figures in Appendices C through F show analyses of surface water supply at each of the stream gages in the basin. These are included to make available a complete, current (1984) presentation of supply information as well as support the discussion in the text. Appendix G contains water withdrawal and discharge data for the basin and is included for similar reasons.

Figure A-1 (Appendix A) shows a map of the basin. The principal river systems are: the Chattooga River in the west of the basin, the Etowah, the Coosawattee, the Conasauga, the Oostanaula, and the Coosa River at the basin outlet. To properly manage and analyze the supply and use data it was necessary to consider the basin by hydrologic sub-units. These are shown in Figure A-2 (Appendix A). This division into sub-units and the related figures are from the Georgia Department of Natural Resources report, Water Availability & Use Coosa River Basin, 1982. Figures A-3 through A-12 (Appendix A) show the major rivers and creeks which are within each sub-unit. The numbers assigned to each sub-unit are for database management only and have no other significance.

Related Studies

In recent years a number of studies have been completed which contain useful data and analyses concerning water supply and use in the Coosa Basin. Some studies cover the entire state of Georgia, the Coosa Basin being only a part. Others cover only part of the basin. They are identified here as useful references for both data and analysis.

* Georgia Department of Natural Resources, Water Availability and Use, Coosa River Basin, 1982.

* Pierce, Robert R. et al., Georgia Department of Natural Resources, Water Use in Georgia by County for 1980. Information Circular 59, 1980.

* U.S. Geological Survey, Georgia Irrigation, 1970-80: A Decade of Growth. Water Resources Investigations Report 83-4177, 1984.

* Rogers, Herbert H., Municipal and Industrial Water Use, Dalton Lake, Georgia. U.S. Army Engineer District, Mobile, September, 1981.

* U.S. Geological Survey, Estimated Use of Water in the United States in 1980, Geological Survey Circular 1001, 1983.

* U.S. Army Corps of Engineers, Mobile, Carters Reservoir, Reservoir Regulation Manual, Appendix H, July 1979.

* Georgia Department of Natural Resources, Coosa River Basin, Water Quality Management Plan, 1978.

* U.S. Geological Survey, Storage Requirements for Georgia Streams, 1983.

* U.S. Geological Survey, Low-Flow Frequency of Georgia Streams, 1978.

* U.S. Geological Survey, Water Resources Data, 1983.

In addition, various maps are available for the basin. Those found to be most useful include,

* U.S. Geological Survey, 7.5 Minute Topographic Maps.

* LANDSAT Color Imagery Map, Northwest Georgia.

* U.S. Geological Survey, 1:100,000 - Scale Metric Topographic Map, Dalton, Cartersville, Chickamauga, Rome, Anniston and Atlanta, Georgia, 1981.

Software Development and Application

A principal objective of this study, in addition to an analysis of the water resources of the Coosa Basin, is to conduct the analyses by using currently available microcomputer software. With the rapid increase in speed and storage in microcomputer hardware and with the development and conversion of generalized software programs for engineering applications, the use of such technology on this study is timely and appropriate. Such use demonstrates the potential for microcomputer technology in water supply planning and serves to bring engineers who could use this technology up to speed in a quick manner. Thus, the selection of the technology, especially the software, testing and applying it to the Coosa Basin became a major task in this investigation. A brief description of the software is presented in Appendix B.

One benefit of using the microcomputer on this study is the availability of all U.S. Geological Survey water supply and water use data for the basin on diskettes. Because such data is historical and will not change, it can be used for other studies of the basin. As new records become available they can be added to the existing files. Also, because all analyses are available on diskettes they can be easily revised as new data becomes available. Such accessibility to basic supply and use data makes future analyses easier.

Authority

This study was conducted by the Hydrologic Engineering Center, Corps of Engineers, 609 Second Street, Davis, California at the request of the Mobile District, Corps of Engineers. Contractural authorization was by DA Form 2544, Order Number FC850051, 29 April 1985.

Acknowledgements

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Burdette and David Ashley with the Georgia Department of Natural Resources; Bob Pierce in the Doraville office of the U.S. Geological Survey; Ricky Hartley, Mobile District, Corps of Engineers. At the Hydrologic Engineering Center, Margaret Schroeder and Clay Willis placed much of the data on the microcomputer, Lynne Fornasero prepared the many figures and tables, and Kimberly Powell did the word processing. Shelle Barkin provided valuable counsel and assistance on the use of the microcomputer hardware and software. David Goldman did the stochastic analysis of streamflow on the Coosawatee River. Bill Johnson was project engineer under the supervision of Darryl Davis, Chief, Planning Division. During the course of this study the Director of the Hydrologic Engineering Center was Bill S. Eichert.

LOW STREAMFLOW IN THE COOSA BASIN

USGS Water Supply Data

Analyses of surface water supplies used gage records at twenty-one locations in the Coosa watershed (Table 1). These data are stored in the U.S. Geological Survey's WATSTORE (National Water Data Storage and Retrieval System) database located in Reston, Virginia. Statistical and mean value data for the twenty-one stations were transferred via phone lines to a microcomputer at the Hydrologic Engineering Center in Davis, California. No adjustments for changing watershed conditions over time were made. Except for the construction of Carter and Alltoona Reservoirs it was felt the effects would be small and not alter the conclusions developed from the analyses. Once transferred, the data were available for analysis purposes. The principal analyses were daily value low-flow frequency and flow-duration relationships. The mean monthly data were used to examine the monthly variation in supply which led to the identification of June through November as low-flow months (Appendix G). The Mobile District, Corps of Engineers has reconsituted daily flow values at the Carters gage (02382500) on the Coosawattee River for a number of years for which there are no recorded flows. This was done by correlating recorded flows at nearby gages with recorded flows at Carters gage and using those correlations to fill in missing daily values at Carters. These reconstituted flows, while appropriate for use in hydrologic analyses, were not used in this study because it was felt that the hydrologic availability of supply could be

TABLE 1
USGS STREAM GAGE LOCATION AND RECORD

STATION	HYDROLOGIC SUB-UNIT	LATITUDE	LONGITUDE	RIVER	NEAR	QUAD MAP	AREA (SQ MI)	YEARS OF RECORD	CLIMATIC YEARS IN RECORD
02380500	1	344018	843031	COOSAWATTEE RIVER	ELLIJAY	WEBB	236.0	30	1940-49; 1965-84
02381600	2	343417	842755	FAUSETT CREEK	TALKING ROCK	DYKE	10.0	9	1976-84
02382200	2	343122	843640	TALKING ROCK CREEK	HINTON	TALKING ROCK	119.0	10	1975-84
02382500	2	343613	844144	COOSAWATTEE RIVER	CARTERS	OAKMAN	521.0	34	1898-00; 1920-23; 1963-72; 1976-84
02383500	2	343435	845137	COOSAWATTEE RIVER	PINE CHAPEL	REDBUD	831.0	45	1940-84
02384500	3	344940	845103	CONASAUGA RIVER	ETON	CHATSWORTH	252.0	2	1983-84
02385800	3	344300	844612	HOLLY CREEK	CHATSWORTH	CALHOUN NE	64.0	23	1962-84
02387000	3	344000	845542	CONASAUGA RIVER	TILTON	DALTON SOUTH	687.0	46	1939-84
02387500	4	343442	845629	OOSTANAULA RIVER	RESACA	CALHOUN NORTH	1602.0	91	1894-84
02388300	4	342157	851617	HEATH CREEK	ROME	ROCK MOUNTAIN	14.7	15	1970-84
02388320	4	342218	851550	HEATH CREEK	ARMUCHEE	ROCK MOUNTAIN	16.6	2	1983-84
02388500	4	341802	850830	OOSTANAULA RIVER	ROME	ROME NORTH	2115.0	44	1941-84
02389000	5	342257	840321	ETOWAH	DAWSONVILLE	DAWSONVILLE	107.0	36	1941-76
02392000	7	341423	842947	ETOWAH RIVER	CANTON	CANTON	613.0	55	1898-05; 1938-84
02394000	7	340947	844428	ETOWAH RIVER	CARTERSVILLE	ALLATOONA DAM	1119.0	45	1940-84
02395000	8	341224	845844	ETOWAH RIVER	KINGSTON	KINGSTON	1634.0	49	1930-31; 1938-84
02395120	8	341434	845323	TWO RUN CREEK	KINGSTON	KINGSTON	33.1	3	1982-84
02396000	8	341526	850930	ETOWAH RIVER	ROME	ROME NORTH	1819.0	62	1906-21; 1940-85
02397000	9	341201	851524	COOSA RIVER	ROME	LIVINGSTON	4040.0	50	1898-03; 1930-31; 1938-58; 1964-84
02397500	9	340338	851841	CEDAR CREEK	CEDARTOWN	CEDARTOWN W	115.0	30	1944-73
02398000	10	342803	852019	CHATTOOGA	SUMMERVILLE	SUMMERVILLE	192.0	48	1938-84

adequately and more consistently described using the measured records alone.

Low-Flow Frequency Analysis

Appendix C contains low-flow frequency curves for stations in the Basin. Three stations with short records were omitted. The curves were developed from WATSTORE low-flow statistics which included records through 1984, except for two stations where records were discontinued at an earlier date. The statistics are plotted using the equation $m/(n + 1)$.

One use of low-flow frequency data is in estimating the 7Q10 flow. (The 7Q10 is an average flow for seven consecutive days which has a probability of 0.10 of not being exceeded during any one year). The magnitude of the 7Q10 flow will change as additional data become available at a gage. Table 2 shows the 7Q10 flows using the current data. Also, shown is the ratio of the 7Q10 flow to the watershed area above the gage. The highest ratio comes from watersheds which drain mountainous areas such as above Ellijay (0.51) and Dawsonville (0.59).

Low-flow frequency analysis uses a single low-flow value each year. If only the low-flow months, June through November, were used, only the daily values for those months would be considered, however, the results would be essentially the same as if the entire year were used. Consider, for example, the 7Q10 flow. The lowest flow for seven consecutive days occurs during the low-flow months, so whether it is selected from June-November or from the entire year, the value selected is the same and its probability is the same. As the number of consecutive days

TABLE 2
7Q10 FLOW AT GAGE LOCATIONS

STATION	RIVER	NEAR	AREA (SQ MI)	7Q10 [1] (CFS)	RATIO (CFS/SQ MI)
02380500	COOSAWATTEE RIVER	ELLIJAY	236.0	120	0.51
02381600	FAUSETT CREEK	TALKING ROCK	10.0	3	0.30
02382200	TALKING ROCK CREEK	HINTON	119.0	28	0.24
02382500	COOSAWATTEE RIVER	CARTERS	521.0	248	0.48
02383500	COOSAWATTEE RIVER	PINE CHAPEL	831.0	278	0.33
02384500	CONASAUGA RIVER	ETON	252.0	NA	
02385800	HOLLY CREEK	CHATSWORTH	64.0	3.2	0.05
02387000	CONASAUGA RIVER	TILTON	687.0	83	0.12
02387500	OOSTANAULA RIVER	RESACA	1602.0	325	0.20
02388300	HEATH CREEK	ROME	14.7	1.2	0.08
02388320	HEATH CREEK	ARMUCHEE	16.6	NA	
02388500	OOSTANAULA RIVER	ROME	2115.0	492	0.23
02389000	ETOWAH	DAWSONVILLE	107	63	0.59
02392000	ETOWAH RIVER	CANTON	613.0	224	0.37
02394000	ETOWAH RIVER	CARTERSVILLE	1119.0	263	0.24
02395000	ETOWAH RIVER	KINGSTON	1634.0	514	0.31
02395120	TWO RUN CREEK	KINGSTON	33.1	NA	
02396000	ETOWAH RIVER	ROME	1819.0	606	0.33
02397000	COOSA RIVER	ROME	4040.0	1210	0.30
02397500	CEDAR CREEK	CEDARTOWN	115.0	32	0.28
02398000	CHATTOOGA	SUMMERVILLE	192.0	66	0.34

1 INTERPOLATED FROM U.S. GEOLOGICAL SURVEY LOW-FLOW FREQUENCY DATA.

increases to 90, 120 or 183 the likelihood of there being some days in the year which are not in the low-flow months increases, however, the effect is small.

Duration-Probability Analysis

Duration-probability curves as shown in Appendix D are developed from low-flow frequency curves by plotting duration on the horizontal axis and probability as a curve. Each probability curve is a section through the family of low-flow frequency curves at the selected probability. Duration-probability curves are useful for examining the change in streamflow with duration for a selected probability. Consider, for example, station 02382500 at Carters (Figure D-4, Appendix D). The flatness of the curve in the range 7 to 30 days for the 0.10 probability shows little change in streamflow as the duration increases. The flow for the 7Q10 event is nearly the same as for the 30Q10 event. Many of the stations in the basin exhibit this same characteristic. Station 02394000 at Cartersville (Figure D-13, Appendix D) shows a significant increase in flow as the duration changes from 7 days to 30 days. Thus, to provide storage for the 30-day duration event would be a significant increase over that for the 7-day duration event. It should be noted that both stations used in this comparison are regulated upstream.

Daily Flow-Duration Analysis

Appendix E contains flow-duration curves for the twenty-one stations in the basin. These curves were developed from WATSTORE flow-duration statistics. Records included daily flows through

1984, except for two discontinued stations. The flow-duration curves show the percent time during the period-of-record that different magnitudes of flow were exceeded. Such information is useful in determining, quantitatively, how selected flows are related to all daily flows in the record. As an example, Table 3 shows at each station how the 7Q10 flows determined from the low-flow frequency analysis are related to all daily flows in the record. An average flow of 120 cfs for seven consecutive days (Station 02380500) has a probability of 0.10 of not being exceeded in any given year, however, during the period of record 99.8 percent of the time the daily flow exceeded 120 cfs. The 7Q10 flow is exceeded 98 percent of the time at all but one station.

Use of daily values for the low-flow months, June through November, instead of for the entire year will alter the flow-duration curves. Examples of these curves for seven selected stations in the basin are also shown in Appendix E, Figures E-22 to E-28. They show a comparison between the flow-duration curves based upon annual and low-flow months daily values. What is significant is that the percent time exceeded remains about the same in the lower range of flows - flows of the magnitude of the 7Q10. Such flows can be expected to be exceeded 96 to 98 percent of the time during the low-flow months.

TABLE 3
7Q10 PERCENT TIME EXCEEDED

STATION	RIVER	NEAR	7Q10[1] (CFS)	PERCENT EXCEEDED[2] (%)
02380500	COOSAWATTEE RIVER	ELLIJAY	120	99.8
02381600	FAUSETT CREEK	TALKING ROCK	3	99.9
02382200	TALKING ROCK CREEK	HINTON	28	99.8
02382500	COOSAWATTEE RIVER	CARTERS	248	98.4
02383500	COOSAWATTEE RIVER	PINE CHAPEL	278	99.2
02384500	CONASAUGA RIVER	ETON	NA	
02385800	HOLLY CREEK	CHATSWORTH	3.2	99.6
02387000	CONASAUGA RIVER	TILTON	83	99.4
02387500	OOSTANAULA RIVER	RESACA	325	99.4
02388300	HEATH CREEK	ROME	1.2	100
02388320	HEATH CREEK	ARMUCHEE	NA	
02388500	OOSTANAULA RIVER	ROME	492	99.5
02389000	ETOWAH	DAWSONVILLE	63	99.3
02392000	ETOWAH RIVER	CANTON	224	99.5
02394000	ETOWAH RIVER	CARTERSVILLE	263	92.3
02395000	ETOWAH RIVER	KINGSTON	514	98.4
02395120	TWO RUN CREEK	KINGSTON	NA	
02396000	ETOWAH RIVER	ROME	606	98.1
02397000	COOSA RIVER	ROME	1210	98.8
02397500	CEDAR CREEK	CEDARTOWN	32	99.1
02398000	CHATTOOGA	SUMMERVILLE	66	98.1

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1 INTERPOLATED FROM U.S. GEOLOGICAL SURVEY LOW-FLOW FREQUENCY DATA.

2 INTERPOLATED FROM U.S. GEOLOGICAL SURVEY FLOW-DURATION DATA.

DROUGHT IN THE COOSA BASIN

Drought Definition

Drought, as it is used in this study, is a period of below normal streamflow. The period of time used in the analysis is a year. Mean annual streamflow is used to distinguish between wet years and dry years. This convention is common in water supply studies although shorter time periods could be used e.g. a season or month. Three parameters help to define drought: duration, magnitude and severity. Duration is the period of time, the number of consecutive years in this study, where the mean annual streamflow at a gage location is below the mean for the period of gage record. Magnitude is the average water deficiency (measured in cfs) below the period-of-record mean value. Severity is defined as the cumulative water deficiency (measured in year-cfs) computed as the product of the duration and the magnitude. These three parameters are used to describe the droughts of record at the twenty-one gages in the basin.

Drought Analysis Using Annual Flow

Figures in Appendix F show for the period-of-record at each gage location, how the yearly mean flow varies from the mean for the period-of-record. Years with means above the record mean are termed wet years and are shown above the base line. Years with means below the record mean are termed dry years and are shown below the base line. Years with no data are shown on the figures to make them consistent with the years of record in Table 1. Of particular interest in this study are the years with annual flows below the record average, the consecutive number of these years, their magnitude and severity.

Table 4 summarizes quantitatively the severest dry years represented by the figures. Those stations listed as NA (not applicable) either had too short a record or too small a severity. The duration of below average streamflow varies from two years to nine years. The magnitude of deficit flow (average for the duration) varies from 6.6 cfs on Heath Creek to 1708 cfs on the Coosa River near Rome. At these same gages the severity (cumulative deficit) ranges from 26.4 year-cfs (19,053 ac-ft) to 10,248 year-cfs (7,424,800 ac-ft). Across each row (Table 4) a profile of the three severest droughts of record may be obtained.

Analysis Using Low-Flow Months

Figures are also presented in Appendix F (Figures F-22 through F-28) which show wet and dry periods for the low-flow months of record for seven selected stations. The period-of-record mean for the months June through November is compared with each year's mean. Years where the annual value is less than the record mean are termed dry periods and are plotted below the line. Table 5 shows the duration, magnitude and severity of the principal dry periods. The duration is the number of consecutive years with the June through November mean below the record mean for June through November. The magnitude is the mean June through November streamflow for those years. Severity is the product of duration times magnitude. These parameters are useful in describing the low-flow season streamflow, however, it should be noted that each year's low-flow or dry season is bounded by a

TABLE 4
PRINCIPAL DROUGHTS OF RECORD

STATION	RIVER	NEAR	YEARS OF RECORD	RECORD MEAN (CFS)	PRINCIPAL DROUGHTS YEARS	DURATION (YRS)	MAGNITUDE (CFS)	SEVERITY (YR-CFS)	YEARS	DURATION (YRS)	MAGNITUDE (CFS)	SEVERITY (YR-CFS)	YEARS	DURATION (YRS)	MAGNITUDE (CFS)	SEVERITY (YR-CFS)
02380500	COOSAWATTEE RIVER	ELLIJAY	30	523	1940-42	3	208	624	1969-70	2	93	186	1944-45	2	84	168
02381600	FAUSETT CREEK	TALKING ROCK	9	20		NA										
02382200	TALKING ROCK CREEK	HINTON	10	215		NA										
02382500	COOSAWATTEE RIVER	CARTERS	34	1217	1903-06	4	249	996	1969-72	4	220	880	1981-83	3	190	570
02383500	COOSAWATTEE RIVER	PINE CHAPEL	45	1514	1940-42	3	597	1791	1953-57	5	218	1090	1969-71	3	230	690
02384500	CONASAUGA RIVER	ETON	2	520		NA										
02385800	HOLLY CREEK	CHATSWORTH	23	124	1969-73	5	28	140	1966-67	2	44	88				
02387000	CONASAUGA RIVER	TILTON	46	1230	1940-43	4	431	1724	1953-57	5	207	1035	1969-72	4	246	984
02387500	OOSTANAULA RIVER	RESACA	91	2832	1894-98	5	725	3625	1940-42	3	1191	3573	1903-06	4	581	2324
02388300	HEATH CREEK	ROME	15	28	1970-73	4	6.6	26.4								
02388320	HEATH CREEK	ARMUCHEE	2	38		NA										
02388500	OOSTANAULA RIVER	ROME	44	3699	1941-42	2	1649	3298	1953-57	5	591	2955	1969-72	4	649	2596
02389000	ETOWAH	DAWSONVILLE	36	268	1953-60	8	53	424	1941-45	5	57	285	1966-67	2	27	54
02392000	ETOWAH RIVER	CANTON	55	1255	1938-45	8	290	2320	1904-05	2	318	636				
02394000	ETOWAH RIVER	CARTERSVILLE	45	1934	1953-61	9	415	3735	1940-45	6	444	2664				
02395000	ETOWAH RIVER	KINGSTON	49	2610	1953-61	9	528	4752	1938-45	8	497	3976	1969-71	3	396	1188
02395120	TWO RUN CREEK	KINGSTON	3	54		NA										
02396000	ETOWAH RIVER	ROME	62	3034	1953-61	9	785	7065	1940-45	6	823	4936	1914-16	3	661	1983
02397000	COOSA RIVER	ROME	50	6805	1940-45	6	1708	10248	1953-58	6	1248	7489	1969-72	4	1107	4429
02397500	CEDAR CREEK	CEDARTOWN	17	157	1953-57	5	42	210	1959-61	3	23	68	1969-71	3	18	54
02398000	CHATTOOGA	SUMMERVILLE	48	362	1940-45	6	98	588	1953-57	5	68	340	1969-72	4	58	234

TABLE 5
PRINCIPAL DRY PERIODS OF RECORD
LOW-FLOW MONTHS, JUNE THROUGH NOVEMBER

STATION	RIVER	NEAR	YEARS OF RECORD	RECORD MEAN (CFS)	PRINCIPAL DRY PERIODS											
					YEARS	DURATION (YRS)	MAGNITUDE (CFS)	SEVERITY (YR-CFS)	YEARS	DURATION (YRS)	MAGNITUDE (CFS)	SEVERITY (YR-CFS)	YEARS	DURATION (YRS)	MAGNITUDE (CFS)	SEVERITY (YR-CFS)
02382500	COOSAWATTEE RIVER	CARTERS	34	808	1968-71	4	181	724	1904-05	2	310	620	1980-83	4	154	616
02383500	COOSAWATTEE RIVER	PINE CHAPEL	45	854	1952-56	5	253	1265	1939-41	3	208	624	1968-70	3	145	435
02387000	CONASAUGA RIVER	TILTON	46	539	1951-56	6	252	1512	1968-70	3	235	705	1943-45	3	216	648
02387500	OOSTANAULA RIVER	RESACA	91	1528	1951-56	6	596	3576	1939-45	7	427	2989	1893-97	5	421	2105
02388500	OOSTANAULA RIVER	ROME	44	1725	1951-56	6	559	3354	1940-45	6	398	2388	1968-72	5	356	1780
02396000	ETOWAH RIVER	ROME	62	2053	1939-47	9	622	5598	1951-62	12	407	4884	1913-14	2	740	1480
02397000	COOSA RIVER	ROME	50	3848	1939-47	9	1024	9216	1951-56	6	1096	6576	193031	2	1607	3214

six month high-flow or wet season. In other words, each year's June through November low-flow season is interrupted with a higher flow season December through May. Thus, duration for a low-flow month analysis has a different meaning than for an annual analysis where dry years are back-to-back.

Figures F-29 through F-34 (Appendix F) show the mean monthly flows for several stations in the basin. They confirm the identification of the months June through November as the low-flow or months below annual mean flow.

WATER USE IN THE COOSA BASIN

Water Use Data

A database of water withdrawal and discharge within the state of Georgia is maintained by the U.S. Geological Survey at Doraville, Georgia. Sixty-one different types of information are included, where available, for each withdrawal and discharge location (entity) for the years 1980 through 1984. The information includes: name of the user, address, contact person, type of withdrawal (surface or ground water), latitude and longitude, well data, stream name, monthly and annual amounts and an identification or entity number. Referred to as the "W&D" database (site specific withdrawals and discharges), a computer tape of these data was provided to the Hydrologic Engineering Center by the U.S. Geological Survey in September 1985 for the counties which are a part of the Coosa Basin. This database became the basis for the analysis of withdrawal and discharge within the basin. While the database is incomplete in many respects, as will be discussed in what follows, it was found to be sufficient for the purposes of this study.

Table 6 shows a profile of the entities in the database. A total of 366 entities were included each year. For the five year period, 1980-1984 there were 1830 entities. Each entity represented a site specific location of withdrawal (surface or groundwater) or discharge. Because many users have more than one withdrawal or discharge location the number of users in the database is less than the number of entities. There are 155 different users identified in the database. Of particular note

TABLE 6
ENTITIES IN W&D DATABASE

	YEAR					TOTAL
	1980	1981	1982	1983	1984	
WITHDRAWAL DATA						
NUMBER OF ENTITIES	156	156	156	156	156	780
NUMBER WITH DATA	17	13	43	45	40	158
PERCENT WITH DATA (%)	10.9	8.3	27.6	28.8	25.6	20.24
DISCHARGE DATA						
NUMBER OF ENTITIES	210	210	210	210	210	1050
NUMBER WITH DATA	97	117	50	74	94	432
PERCENT WITH DATA (%)	46.2	55.7	23.8	35.2	44.8	41.14
TOTAL						
NUMBER OF ENTITIES	366	366	366	366	366	1830
NUMBER WITH DATA	114	130	93	119	134	590
PERCENT WITH DATA (%)	31.1	35.5	25.4	32.5	36.6	32.22

is the fact that of the 1830 row entries for the five year period, 1980-1984, only 590 or 32.2 percent had annual withdrawal or discharge data. These data varied by year as shown in Table 6. For 1980 there were 17 entities with withdrawal data or 10.9 percent of all entities for that year. For 1984 this had increased to 40 entities or 25.6 percent of all entities for that year. Discharge data is more complete. For 1980, 46.2 percent of the entities have data. For 1984 this figure is 44.8 percent.

For use in this study three principal modifications to the original database were made. First, only those entities with annual data were analyzed thus creating a non-zero database. Second, those entities which are outside the boundaries of the Coosa Basin were removed from the database. They had originally been included because they were in the county, part of which was in the watershed. Third, entities whose withdrawal source was groundwater were removed because groundwater is not a principal purpose of this study. A profile of the resulting database is shown in Table 7. It is referred to in this study as the "USGS" database.

The USGS database was compared with the data developed and presented in the study, Water Availability and Use - Coosa River Basin, 1982. Most of the users in the Water Availability and Use study were in the USGS database. Those which were not were small users such as elementary schools and small commercial organizations. A list of these users and their September 1980 discharge from the Water Availability and Use study is shown in Table 8.

TABLE 7
ENTITIES IN USGS DATABASE

	YEAR					TOTAL
	1980	1981	1982	1983	1984	
WITHDRAWAL DATA						
NUMBER OF ENTITIES	9	8	23	23	21	84
DISCHARGE DATA						
NUMBER OF ENTITIES	60	79	33	45	63	280
TOTAL						
NUMBER OF ENTITIES	69	87	56	68	84	364

TABLE 8
USERS NOT IN USGS DATABASE
BUT IN WATER AVAILABILITY AND USE[1]

HYDROLOGIC SUB-UNIT	USER	STREAM	SEPT 80 FLOW (CFS)
3	VARNELL ELEMENTARY SCHOOL	TRIB-TRIB COAHULLA CR	0.02
3	ROLLING HILLS MOBILE HOME PARK	TRIB-TRIB COAHULLA CR	0.06
3	DAWNVILLE ELEMENTARY SCHOOL	TRIB-COAHULLA-CONASAUGA	0.02
3	DUG GAP ELEMENTARY SCHOOL	DROWNING BEAR CR	0.02
3	EASTBROOK MIDDLE SCHOOL	LITTLE CR-DROWNING BEAR C	0.03
3	COLORDYNE INC	TRIB TO CONASAUGA R	0.05
3	SAFARI LES '2' ACRES CAMPGROUND	SWAMP CR-CONASAUGA R	0.09
3	DALTON AMACO TRUCK PLAZA	SWAMP CR-CONASAUGA R	0.01
3	VALLEY POINT ELEMENTARY SCHOOL	TRIB-SWAMP CR-CONASAUGA R	0.03
3	DAVIS BROTHERS MOTOR LODGE AND CAFE	TRIB-LITTLE SWAMP CR	0.04
3	TEXTILE RUBBER AND CHEMICAL CO	TRIB-LITTLE SWAMP CR	0.05
3	VALLEY POINT MIDDLE SCHOOL	TRIB-LITTLE SWAMP CR	0.02
4	SHELL SERVICE STATION	TRIB TO OOTHKALOOGA CR	0.02
4	PATTYS TRUCK STOP	TRIB TO OOTHKALOOGA CR	0.02
4	GA DOT SAFETY REST AREA #34	TRIB TO OOTHKALOOGA CR	0.05
4	RAMADA INN	TRIB-BLACKWOOD CR-OOTHKAL	0.04
4	WELLCO CARPET CO	BLACKWOOD CR-OOTHALOOGA	0.00
4	GEORGIA CUMBERLAND ACADEMY	OOSTANAULA R	0.02
4	ARMUCHEE ELEMENTARY SCHOOL	ARMUCHEE CR-OOSTANAULA R	0.01
4	BURLINGTON AND KLOPMAN HILLS	WARD CR-OOSTANAULA R	0.06
6	FREE HOME ELEMENTARY	TRB-SITTINGDOWN CR-ETOWAH	0.06
6	TATE LOW RENT HOUSING	TRIB-LONG SWAMP-ETOWAH	0.11
6	JASPER WEST POND	TRIB-SHARP MTN CR	0.15
7	RM MOORE SCHOOL	SHOAL CR-ETOWAH R	0.01
7	REINHARDT COLLEGE	SHOAL CR-ETOWAH R	0.04
7	CANTON NURSING HOME	TRIB TO ETOWAH R	0.01
7	LITTLE RIVER WPCP	ROCKY-LITTLE-ETOWAH	0.18
7	LITTLE RIVER ELEMENTARY SCHOOL	TRIB-LITTLE R	0.01
7	KENNESAW HILL MHP	NOONDAY CR-LITTLE R	0.07
7	BELLS FERRY PLAZA	TRIB-NOONDAY CR	0.01
7	BELLS FERRY MHP	TRIB-NOONDAY CR-LITTLE R	0.06
7	CHAPMAN ELEMENTARY	TRIB-NOONDAY-LITTLE-ETOWA	0.03
7	EASTCATE MHP	OWL CR-LAKE ALLATOONA	0.02
7	OAK GROVE ELEMENTARY	KELLOG CR-LAKE ALLATOONA	0.01
7	SHADOWOOD MHP	TRIB-OWL CR-LAKE ALLATOON	0.07
7	ALLATOONA ENTERPRISES (BARTOW CO)	TRIB TO ETOWAH R	0.03
8	NEW HOPE SCHOOL	TRB-TRB-PUMPKINVINE-ETOWAH	0.02
8	THREE CEDARS MHP	PICKETTS MILL CR	0.02
8	WHITE ELEMENTARY SCHOOL	PETTIT CR-ETOWAH R	0.02
8	HABERSHAM ESTATES SUBDIVISIONS	TRIB-TRIB PETTIT C-ETOWAH	0.06
8	CROWN INN	PETTIT CR-ETOWAH R	0.00
8	CALITE CORP	SIMPSON CR-EUHARLEE CR	0.56
9	BENEDICT EARLY CHILDHOOD CENTER	CEDAR CR	0.01
10	LYERLY ELEMENTARY SCHOOL	TRIB TO CHATTOOGA R	0.0[illegible]
10	CAMP AQUILLA (YWCA)	CLARKS CR-CHATTOOGA R	0.04

1 GEORGIA DEPARTMENT OF NATURAL RESOURCES. WATER AVAILABILITY AND USE. COOSA RIVER BASIN. 1982.

The monthly and annual withdrawal and discharge data contained in the USGS database are tabulated in Appendix G. These data are the data used in the analysis of water use and are the non-zero surface water data from the USGS W&D database, September 1985.

Major Withdrawals and Discharges

The major surface water withdrawals for which the USGS database contains data are shown in Table 9. Georgia Power's, Hammond Thermal Power Plant on the Coosa River at the outlet of the Coosa Basin withdraws the greatest amount. However, because it is at the outlet of the watershed and because virtually all of it is returned to the river (See Water Availability and Use study) the withdrawal is of little consequence in this investigation. Of the remaining users, 93 percent of the amount withdrawn is withdrawn by the next six users listed. This illustrates that relatively few users account for most of the withdrawal.

Major discharges are shown in Table 10. Georgia Power's Hammond and Bowen plants and Georgia Kraft Company's Krannert Division are not shown because data on discharge was not available in the USGS database. From the Water Availability and Use study using September 1980 data the discharge at Hammond is 99.9 percent of withdrawal, at Bowen 21.8 percent, and at Georgia Kraft 69.6 percent. Of the discharges shown in Table 10 the first ten account for 80 percent of the water discharged. Again indicating most discharge is concentrated in relatively few users.

TABLE 9
SURFACE WATER WITHDRAWAL, 1984

ENTITY1	ENTITY2	ENTITY3	YEAR	HYDROLOGIC SUB-UNIT	STREAM NAME	USER	ANNUAL AVERAGE (MGD)
057	T01	01	84	9	COOSA RIVER	GA POWER-HAMMOND THERM PL	454.09
008	T01	01	84	8	ETOWAH RIVER	GA POWER-PLANT BOWEN	52.900
033	M01	01	84	7	LAKE ALLATOONA	COBB CO MARIETTA WAT AUTH	28.774
155	M01	01	84	3	CONASAUGA RIVER	CITY OF DALTON	27.046
057	I04	01	84	9	COOSA RIVER	GA KRAFT CO KRANNERT DIV.	15.861
064	M01	02	84	4	COOSAWATTEE RIVER	CITY OF CALHOUN	10.007
057	M04	01	84	4	OOSTANAULA RIVER	CITY OF ROME	7.8180
155	M01	03	84	3	MILL CREEK	CITY OF DALTON	5.6320
057	I05	01	84	9	SILVER CREEK	WEST POINT PEPPERELL INC	3.2000
028	M02	01	84	6	ETOWAH RIVER	CITY OF CANTON	2.3120
105	M01	02	84	3	ETON SPRINGS	CITY OF CHATSWORTH	1.2960
115	M03	01	84	8	EUHARLEE CREEK	CITY OF ROCKMART	0.8900
146	M03	02	84	10	DRY CREEK	CITY OF LAFAYETTE	0.8290
105	M01	01	84	3	HOLLY CREEK	CITY OF CHATSWORTH	0.4770
061	M01	01	84	1	ELLIJAY RIVER	CITY OF ELLIJAY	0.4490
061	M01	02	84	1	CARTECAY RIVER	CITY OF ELLIJAY	0.3660
057	I03	01	84	4	WOODWARD CREEK	BURLINGTON IND-BRIGHTON	0.3420
057	M03	01	84	9	POSSUM TROT RES	BERRY SCHOOLS	0.3030
064	M02	01	84	2	SALACOA CREEK	CITY OF FAIRMONT	0.1800
093	N07	01	84	5	UPPER ETOWAH RIVER	CAMP F D MERRILL	0.0260
061	N07	01	84	2	CARTERS LAKE	USCE CARTERS LAKE-DOLL MT	0.0010

TABLE 10
SURFACE WATER DISCHARGE, 1984

ENTITY1	ENTITY2	ENTITY3	YEAR	HYDROLOGIC SUB-UNIT	STREAM NAME	USER	ANNUAL AVERAGE (MGD)
155	M01	D1	84	3	DROWNING BEAR CREEK	CITY OF DALTON	10.548
057	M04	D1	84	9	COOSA RIVER	CITY OF ROME	8.7380
057	I05	D2	84	9	SILVER CREEK	WEST POINT PEPPERELL INC	7.2000
064	M01	D1	84	4	OOSTANAULA RIVER	CITY OF CALHOUN	6.2050
155	M01	D2	84	3	DROWNING BEAR CREEK	CITY OF DALTON	5.1010
008	M02	D1	84	8	ETOWAH RIVER	CITY OF CARTERSVILLE	4.3220
033	M02	D6	84	7	NOONDAY CREEK	COBB CO MARIETTA WAT AUTH	3.9330
027	M05	D1	84	10	CHATTOOGA RIVER TRIB	TOWN OF TRION	3.5210
146	M03	D1	84	10	CHATTOOGA CREEK	CITY OF LAFAYETTE	2.9170
027	M04	D1	84	10	CHATTOOGA RIVER TRIB	CITY OF SUMMERVILLE	2.0430
008	I05	D1	84	8	ETOWAH RIVER	NEW RIVERSIDE OCHRE CO	1.2680
061	M01	D1	84	2	COOSAWATTEE RIVER	CITY OF ELLIJAY	1.1020
115	M03	D1	84	8	EUHARLEE CREEK	CITY OF ROCKMART	1.0800
115	M01	D1	84	9	CEDAR CREEK	CITY OF CEDARTOWN	1.0600
008	I06	D1	84	8	ETOWAH RIVER	CHEMICAL PRODUCTS CORP.	1.0090
105	M01	D1	84	3	HOLLY CR-CONASAUGA R	CITY OF CHATSWORTH	1.0040
008	I01	D2	84	8	ETOWAH RIVER	THOMPSON WIENMAN COMPANY	0.8280
057	M02	D2	84	4	SILVER CR TRIBUTARY	FLOYD COUNTY WATER SYSTEM	0.6770
028	I01	D1	84	7	BLANKETS CREEK	CENTRAL SOYA OF ATHENS	0.5976
028	M02	D1	84	6	ETOWAH RIVER TRIB	CITY OF CANTON	0.5050
057	M02	D1	84	4	COOSA RIVER	FLOYD COUNTY WATER SYSTEM	0.4760
033	M03	D1	84	7	TANYARD CREEK	CITY OF ACWORTH	0.4640
057	M01	D1	84	9	CEDAR CREEK TRIB.	CITY OF CAVE SPRING	0.4560
057	I05	D1	84	9	SILVER CREEK	WEST POINT PEPPERELL INC	0.4510
115	I01	D1	84	9	B CEDAR C&B SP CR	DIAMOND SHAMROCK CO	0.3510
057	I12	D1	84	9	PRENTISS CREEK	ALCAN BUILDING PRODUCTS	0.2760
027	I04	D1	84	10	CHATTOOGA RIVER	BIGELOW SANFORD IN-LYERLY	0.2720
110	M01	D1	84	8	WEAVER CREEK	CITY OF DALLAS	0.2720
057	I11	D1	84	9	TRIB-LITTLE CRY CR	FLORIDA ROCK INDUSTRIES	0.2590
057	M02	D3	84	4	WARD C-OOSTANAULA R	FLOYD COUNTY WATER SYSTEM	0.2070
008	M01	D1	84	4	OOTHKALOOGA CREEK	CITY OF ADAIRSVILLE	0.1860
146	N05	D1	84	10	CRAWFISH CREEK	DOR-WALKER COUNTY PRISON	0.1710
060	M05	D4	84	7	LITTLE RIVER	FULTON COUNTY	0.1570
027	I04	D2	84	10	CHATTOOGA RIVER	BIGELOW SANFORD IN-LYERLY	0.1540
115	I07	D1	84	8	TRIB-EUHARLEE CR	GOODYEAR TIRE AND RUBBER	0.1450
008	I07	D1	84	8	PETTIT CREEK	GOODYEAR TIRE AND RUBBER	0.1330
146	I12	D1	84	10	TRIB-CHATTOOGA CR	ROPER CORP	0.1010
028	I03	D1	84	6	ETOWAH RIVER	GOLDKIST INC	0.1010
064	I04	D1	84	4	OOTHKALOOGA CR	GOODYEAR TIRE AND RUBBER	0.1000
115	M02	D1	84	8	EUHARLEE CREEK	POLK CO WATER AUTHORITY	0.0810
112	M01	D2	84	6	TOWN CR (POLECAT CR)	CITY OF JASPER	0.0750
155	I04	D1	84	3	CONASAUGA RIVER	DOW CHEMICAL-USA	0.0730
008	M06	D2	84	8	TWO RUN CREEK	BARTOW CO WATER SYSTEM	0.0690
028	M03	D1	84	7	RUBES CREEK	CITY OF WOODSTOCK	0.0600
112	M01	D1	84	6	HAMMONDS CREEK	CITY OF JASPER	0.0550

ENTITY1	ENTITY2	ENTITY3	YEAR	HYDROLOGIC SUB-UNIT	STREAM NAME	USER	ANNUAL AVERAGE (MGD)
033	M02	E4	83	7	BUTLER CREEK	COBB CO MARIETTA WAT AUTH	0.0500
110	M01	D2	84	8	LAWRENCE CREEK	CITY OF DALLAS	0.0480
042	M01	D1	84	6	FLAT CREEK	CITY OF DAWSONVILLE	0.0420
008	M06	D1	84	8	PETTIT CREEK	BARTOW CO WATER SYSTEM	0.0390
033	M02	D3	84	7	NOONDAY CREEK	COBB CO MARIETTA WAT AUTH	0.0370
064	I03	D1	84	2	SALACOA CREEK	ED LACY MILLS	0.0280
155	I08	D1	84	3	COAHULLA CREEK	DALTON ROCK PRODUCTS CO.	0.0260
033	M02	D9	84	7	BUTLER CREEK	COBB CO MARIETTA WAT AUTH	0.0240
105	I05	D1	84	3	TOWN BRANCH	DIXIE YARNS INC.	0.0210
064	N03	D1	84	4	TRIB OOTHKALOOGA CR	DOT-SAFETY REST AREA #34	0.0200
033	M02	E4	84	7	BUTLER CREEK	COBB CO MARIETTA WAT AUTH	0.0170
064	I05	D1	84	2	LEWIS BR-SALACOA CR	DALTON ROCK PRODUCTS CO.	0.0160
033	M02	E4	81	7	BUTLER CREEK	COBB CO MARIETTA WAT AUTH	0.0100
033	M02	E4	80	7	BUTLER CREEK	COBB CO MARIETTA WAT AUTH	0.0090
008	M05	D1	84	8	PUMKINVINE CREEK	CITY OF EMERSON	0.0060
155	I12	D2	84	3	SWAMP CREEK	C&J LEASING COMPANY	0.0036
115	I04	D1	84	9	BIG SP BR-CEDAR CR	ALTON BOX BOARD CO	0.0020
105	I05	D2	84	3	TOWN BRANCH	DIXIE YARNS INC.	0.0010

Table 11 shows the estimated surface water consumption in 1984 for users for which both withdrawal and discharge data were available or were estimated. The Cobb County Marietta Water Authority consumption is largely a transfer out of the basin. The net loss to the basin is approximately 86.7 MGD. Using the totals for withdrawal (excluding Hammond Thermal Plant) and discharge (including estimates of Bowen Power Plant and Georgia Kraft) in Tables 9 and 10, the total amount consumed is 59.0 MGD. An accurate estimate for the Basin is difficult to make because of incomplete data for both withdrawal and discharge. However, an amount within this range seems probable.

Monthly Variation in Withdrawal and Discharge

Using average values in analysis - annual, seasonal or monthly - can sometimes mask the variation which exists in water use. It is of concern that by using average values the peak needs of a month or period may be "reduced" or missed. The withdrawal and discharge data in the USGS database was examined to determine this variation.

Using 1984 withdrawal and discharge data the sample standard deviation (the root-mean-square deviation) was computed for the twelve monthly values for each year and for the six values for the low-flow months June through November for each user. For the withdrawal data the standard deviation varied from a low of near 0 MGD to a high of 4.9 MGD for all months, to a range of 0 MGD to 2.9 MGD for the low-flow months (excluding the Hammond and Bowen power plants). These statistics show that variation in

TABLE 11
SURFACE WATER CONSUMPTION, 1984

ENTITY1	ENTITY2	ENTITY3	HYU	USER	TOTAL WITHDRAWAL (MGD)	TOTAL DISCHARGE (MGD)	CONSUMPTION (MGD)	PERCENT CONSUMPTION (%)
033	M01	01	7	COBB CO MARIETTA WAT AUTH	28.8	4.0	24.8	86.1
008	T01	01	8	GA POWER-PLANT BOWEN	52.9	11.5 [1]	41.4	78.3
028	M02	01	6	CITY OF CANTON	2.3	0.5	1.8	78.2
105	M01	01	3	CITY OF CHATSWORTH	1.8	1.0	0.8	43.4
064	M01	02	4	CITY OF CALHOUN	10.0	6.2	3.8	38.0
057	I04	01	9	GA KRAFT CO KRANNERT DIV.	15.9	11.1 [1]	4.8	30.2
155	M01	01	3	CITY OF DALTON	32.7	2[illegible].5	9.1	27.8

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1 ESTIMATED FROM SEPTEMBER 1980 DATA, WATER AVAILABILITY AND USE STUDY, 1982.

withdrawal from month to month is relatively small. It is less for the low-flow months than for the entire year. The Hammond and Bowen power plants had standard deviations of 42.5 MGD and 14.4 MGD respectively. These represented 8.8 and 22.5 percent of the average monthly flow.

Similar variation exists in monthly discharge data. The standard deviation ranges from 0 MGD to 2.7 MGD for all months to 0 MGD to 2.1 MGD for the six low-flow months. The greatest variation occurs at the City of Rome and City of Dalton discharge locations. The standard deviation for other discharges was considerably less - in all cases less than 1.0 MGD.

Annual Variation in Withdrawal and Discharge

An analysis of annual withdrawal and discharge data for the period 1980-84 shows no consistent pattern of change (Appendix G). The change from year to year varies with user. For some users there is relatively little change, for others some years are higher, other years lower. Withdrawals from the Conasauga River by the City of Dalton increased from 23.6 MGD in 1980 to 27.0 MGD in 1984. For the City of Calhoun, withdrawal went from 8.3 MGD in 1980 to 10.0 in 1984. Other major withdrawals, Georgia Kraft, Bowen Power Plant, Hammond Thermal Plant had a variable change during the period for which data was available. Discharges have followed a pattern consistent with withdrawal.

WATER SUPPLY/USE BALANCE

Water Balance Definition

A water balance is the systematic presentation of water supply and use data within a geographic region for a specific period of time. A water balance may be developed for a state, river basin, river reach or specific site. For the Coosa River Basin a water balance was developed for the basin and hydrologic sub-units within the basin. Surface water supply is compared with 1984 water withdrawal and discharge. A principal purpose of such a comparison is to assess the adequacy of supply relative to use.

Coosa River Basin

Table 12 presents a comparison of supply and use for the Coosa Basin by hydrologic sub-unit (See maps in Appendix A). Data for the table were developed from mean flow records from the USGS WATSTORE database and from 1984 withdrawal and discharge data from the USGS water use database. The hydrologic sub-unit is a convenient basin division for comparing supply and use because of the availability of a stream gage to describe the supply and it is small enough to describe withdrawal and discharge which occurs on both main streams and tributaries. The purpose of balancing supply and use in this way is to show the availability of supply relative to current use.

Table 12 shows the hydrologic sub-unit number, its name and the stream gage at its outlet. For each gage, the lowest mean annual flow and lowest mean September flow were determined. These flows were used to describe supply under the lowest flow

TABLE 12
BASIN WATER BALANCE
MINIMUM STREAMFLOW OF RECORD AND 1984 WITHDRAWAL AND DISCHARGE

HYDROLOGIC SUB-UNIT	NAME	GAGE AT OUTLET	MINIMUM STREAMFLOW OF RECORD [1]		SUB-UNIT WITHDRAWAL ABOVE GAGE		SUB-UNIT DISCHARGE ABOVE GAGE		CUMULATIVE WITHDRAWAL ABOVE GAGE		CUMULATIVE DISCHARGE ABOVE GAGE		CUMULATIVE WITHDRAWAL MINUS DISCHARGE (CONSUMPTION)		CONSUMPTION AS PERCENTAGE OF MINIMUM STREAMFLOW [5]	
			ANNUAL (CFS)	SEPTEMBER (CFS)	ANNUAL (MGD)	SEPTEMBER (MGD)	ANNUAL (MGD)	SEPTEMBER (MGD)	ANNUAL (MGD)	SEPTEMBER (MGD)	ANNUAL (MGD)	SEPTEMBER (MGD)	ANNUAL (MGD)	SEPTEMBER (MGD)	ANNUAL (%)	SEPTEMBER (%)
1	ELLIJAY	02380500	256	142	0.82	0.78	0.00	0.00	0.82	0.78	0.00	0.00	+.82	+.78	.5%	.9%
2	CARTERS LAKE	02383500	717	276	0.18	0.21	1.10	1.00	1.00	0.99	1.10	1.00	-.10	-.01	NA	NA
3	DALTON-CHATSWORTH	02387000	505	84.3	34.40	36.40	24.80	23.20	34.40	36.40	24.80	23.20	+9.60	+13.20	2.9%	24.2%
4	CALHOUN-ROME NORTH	02388500	1626	530	18.20	19.40	7.90	6.80	53.60	56.80	33.80	31.00	+19.80	+25.80	1.9%	7.5%
5	DAWSONVILLE	02389000	135	59.2	0.03	[illegible]	0.00	0.00	0.03	0.02	0.00	0.00	+.03	+.02	.03%	.05%
6	CANTON	02392000	622	230	2.30	[illegible]	7[illegible]	0.60	2.30	2.40	0.78	0.60	+1.50	+1.80	.4%	1.2%
7	ALLATOONA LAKE	02[illegible]	[illegible]72	420	28.80	34.5[illegible]	3[illegible] [3]	4.40 [3]	31.10	36.90	6.10	5.00	+25.00	+31.90	3.6%	11.8%
8	CARTERSVILLE-ROME EAST	02[illegible]00	1[illegible]3	588	53.80	60.[illegible]	20.9[illegible] [4]	20.60 [4]	84.90	97.70	26.90	25.60	+58.00	+72.10	5.9%	19.0%
9	ROME-CEDARTOWN	02[illegible] [2]	[illegible]6	1106	473.40	5[illegible]	[illegible]	[illegible]37.20	61[illegible].90	[illegible]85.20	544.00	593.80	+67.90	+91.40	3.2%	12.8%
10	SUMMERVILLE-LAFAYETTE	02[illegible] [2]	8	63.2	0.83	0.72	9.20	6.50	0.83	0.72	9.20	8.50	-8.40	-7.80	NA	NA

----

1 BASED UPON WATER YEAR, OCTOBER THROUGH SEPTEMBER
2 THESE GAGES ARE NOT AT THE OUTLET OF THE SUB-UNIT
3 INCLUDES AN ESTIMATE OF DISCHARGE FOR BOWEN POWER PLANT
4 INCLUDES AN ESTIMATE OF DISCHARGE FOR HAMMOND POWER PLANT AND GEORGIA KRAFT
5 PERCENTAGES ARE COMPUTED AS CUMULATIVE DISCHARGE MINUS WITHDRAWAL
TIMES 1.547 CFS/MGD DIVIDED BY MINIMUM STREAMFLOW TIMES 100

conditions of record. It is assumed that these minimum flows do not reflect consumption upstream. This is reasonable because many minimum streamflows occurred prior to major development in the watershed. Sub-unit and cumulative sub-unit (sub-units above and tributary) withdrawal and discharge data describe representative use of surface water. Also, presented is the consumptive use of water cumulative to the gage at the outlet. This represents the estimated consumption in the sub-unit or sub-units tributary to the gage. These data are also presented as a percentage of the minimum streamflow at the gage. Sub-unit 9 gives an indication of consumptive use in the sub-units and basin overall.

What do these data tell about the relation between supply, withdrawal and discharge? First, it should be noted that the supply to which 1984 use is being compared is the lowest of record, and therefore has a low probability of occurring. Second, for all sub-units, the annual consumption is small relative to supply (less that 6 percent of minimum mean streamflow). Thus, on an annual basis, wet and dry season, supply is clearly adequate. For the month of September consumptive use may still be regarded as small relative to supply - less than 13 percent for all sub-units except sub-unit 8 (19.0%) and sub-unit 3 (24.2%). In sub-unit 3 the higher consumption is from Dalton and in sub-unit 8 from Bowen Power Plant.

Consideration is given in Table 13 to the in-stream 7Q10 requirement for water quality. Withdrawal (converted from mgd to

TABLE 13

BASIN WATER BALANCE

MINIMUM STREAMFLOW OF RECORD, 1984 WITHDRAWAL, AND 7Q10 REQUIREMENTS

HYDROLOGIC SUB-UNIT	NAME	GAGE AT OUTLET	MINIMUM MEAN STREAMFLOW OF RECORD [1]		CUMULATIVE WITHDRAWAL		7Q10	CUMULATIVE WITHDRAWAL PLUS 7Q10		CUMULATIVE WITHDRAWAL AND 7Q10 AS PERCENTAGE OF MINIMUM STREAMFLOW	
			ANNUAL (CFS)	SEPTEMBER (CFS)	ANNUAL (MGD)	SEPTEMBER (MGD)	(CFS)	ANNUAL (CFS)	SEPTEMBER (CFS)	ANNUAL (%)	SEPTEMBER (%)
1	ELLIJAY	02380500	256	142	0.82	0.78	120.00	121.27	121.21	47.37	85.36
2	CARTERS LAKE	02383500	717	276	1.00	0.99	325.00	326.55	326.53	45.54	118.31
3	DALTON-CHATSWORTH	02387000	505	84.3	34.40	36.40	83.00	136.22	139.31	26.97	165.26
4	CALHOUN-ROME NORTH	02388500	1626	530	53.60	56.80	492.00	574.92	579.87	35.36	109.41
5	DAWSONVILLE	02389000	135	59.2	0.03	0.02	63.00	63.05	63.03	46.70	106.47
6	CANTON	02392000	622	230	2.30	2.40	224.00	227.56	227.71	36.58	99.01
7	ALLATOONA LAKE	02394000	1072	420	31.10	36.90	263.00	311.11	320.08	29.02	76.21
8	CARTERSVILLE-ROME EAST	02396000 [2]	1533	588	84.90	97.70	606.00	737.34	757.14	48.10	128.77
9	ROME-CEDARTOWN	02397000 [2]	3236	1106	611.90	685.20	1210.00	2156.61	2270.00	66.64	205.24
10	SUMMERVILLE-LAFAYETTE	02398000	188	63.2	0.83	0.72	66.00	67.28	67.11	35.79	106.19

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1 BASED UPON WATER YEAR, OCTOBER THROUGH SEPTEMBER

2 THESE GAGES ARE NOT AT THE OUTLET OF THE SUB-UNIT

cfs) is added to the 7Q10 requirements and compared with the minimum annual and September streamflows of record. Using annual data the 7Q10 plus withdrawal is less than 50 percent of the minimum streamflow at the gage except for sub-unit 9 where it is 66.6 percent. For the month of September this flow exceeds the minimum mean monthly flow at seven gage sites. This is to say that should a flow as low as the lowest September flow occur, withdrawals upstream may have to be cut back to insure that in-stream requirements are met. It should be noted that this analysis considers the hydrologic sub-unit as a whole and is not specific to each withdrawal point along the river. Therefore, it is only approximate and may be considered as a worse case indication of the supply/in-stream use balance for the sub-unit and not specific withdrawal points.

ALTERNATIVE SUPPLY: WITHDRAWAL AT CARTERS

Withdrawal of water from the Coosawattee River below Carters Lake or withdrawal directly from Carters Lake are considered two likely alternative supply sources to the Dalton Lake project. Because withdrawal from the Coosawattee River below Carters Reservoir is considered the most likely alternative it is the alternative presented in detail here. The analyses which follow examine the operation of Carters Reservoir; the historical streamflow records downstream; stochastic analyses of streamflow at Carters; and the impact downstream of withdrawing water from the Coosawattee River near Carters. Figure H-1 (Appendix H) shows the stream gages and downstream locations involved in the analyses. These analyses provide a hydrologic assessment of the availability of supply near Carters. The sizing of necessary withdrawal facilities, their location and estimated cost will be made by the Mobile District, Corps of Engineers as part of their Dalton Lake investigation.

Operation of Carters Reservoir

Since its completion in November 1974, Carters Dam has regulated inflow from the Coosawattee River below Ellijay, Talking Rock Creek and local drainage around the reservoir. Flood control and hydroelectric power are the authorized purposes of the Reservoir. The generation schedule is established on a weekly basis by the Georgia Power Company and releases are made by the Corps of Engineers in accordance with arrangements with the Southeastern Power Administration.

Filling of the reservoir occurred from closure in November 1974 until top of power pool was reached in July 1975 (Figure H-2, Appendix H). During the first 6 years of the project's operation the hydropower schedule and pumpback use of the re-reg reservoir had a major effect on the re-reg discharge regime. Flows from day-to-day could vary from the channel capacity of 4500 cfs to the minimum required release of 240 cfs. This variability occurred during both the wet and dry periods of the year. In general through, the project discharged inflows over a one to two week period. However, in response to bank sloughing and environmental objections to this mode of operating, the operation of the re-regulation dam was changed. The project still discharges inflow over a one to two week period (unless flow is controlled by the minimum 240 discharge) but discharges are steady over 7 days when discharging less than 600 cfs and vary only slightly when discharges are higher. In general, hydropower release patterns are completely re-regulated by the re-regulation dam.

Operation records show a wide variation in reservoir storage during the low-flow period June through November (Tables 14 and 15 and Figures H-3 and H-4). Over the period of record (August 1975 through September 1984) the difference between minimum and maximum end-of-month storage in the main reservoir was 42,000 ac-ft. In the re-regulation reservoir the difference was 16,000 ac-ft (August 1975 through September 1983). To simulate the reservoir operation over the historical period, or any representative stochastic sequence, the actual operating criteria

TABLE 14
END-OF-MONTH STORAGE
CARTERS RESERVOIR (MAIN)

YEAR	MONTH	STORAGE (AC-FT)	YEAR	MONTH	STORAGE (AC-FT)
1975	AUG	376400	1980	JUN	369900
	SEP	375100		JUL	370200
	OCT	374600		AUG	373700
	NOV	377300		SEP	378500
1976	JUN	383600		OCT	376600
	JUL	368300		NOV	378400
	AUG	358100	1981	JUN	379700
	SEP	360100		JUL	367700
	OCT	359200		AUG	369600
	NOV	362100		SEP	363800
1977	JUN	373700		OCT	355500
	JUL	378100		NOV	366400
	AUG	368200	1982	JUN	376300
	SEP	381700		JUL	373800
	OCT	377500		AUG	378400
	NOV	377800		SEP	362000
1978	JUN	368500		OCT	379500
	JUL	382000		NOV	382300
	AUG	370900	1983	JUN	380000
	SEP	381500		JUL	384700
	OCT	379700		AUG	380500
	NOV	379400		SEP	374000
1979	JUN	375600		OCT	373200
	JUL	388100		NOV	374200
	AUG	380000	1984	JUN	384700
	SEP	382300		JUL	397700
	OCT	378200		AUG	371500
	NOV	382100		SEP	373500

TABLE 15
END-OF-MONTH STORAGE
CARTERS RESERVOIR (RE-REGULATION)

YEAR	MONTH	STORAGE (AC-FT)	YEAR	MONTH	STORAGE (AC-FT)
1975	AUG	3500	1980	JUN	15000
	SEP	3900		JUL	13900
	OCT	2800		AUG	10600
	NOV	900		SEP	6700
1976	JUN	7000		OCT	8200
	JUL	3600		NOV	7100
	AUG	3700	1981	JUN	8700
	SEP	4400		JUL	16900
	OCT	2900		AUG	16100
	NOV	5800		SEP	13600
1977	JUN	9900		OCT	13700
	JUL	8100		NOV	12400
	AUG	15900	1982	JUN	9900
	SEP	3800		JUL	11900
	OCT	9300		AUG	7100
	NOV	6300		SEP	15400
1978	JUN	12600		OCT	7800
	JUL	5200		NOV	9000
	AUG	13200	1983	JUN	11500
	SEP	3300		JUL	5300
	OCT	5400		AUG	7600
	NOV	6500		SEP	9800
1979	JUN	9300		OCT	8500
	JUL	4500		NOV	10600
	AUG	5700	1984	JUN	6400
	SEP	3800		JUL	8500
	OCT	6500		AUG	8200
	NOV	7000		SEP	5900

must be specified together with storage levels in the reservoirs. Because releases are made based upon power demand it is difficult to establish criteria for reservoir simulation. Although conventional generation of Carters Dam (and drawdown of Carters and augmentation of flow downstream of the re-regulation dam) is possible, under present hydropower marketing arrangements, the power customer has elected to defer receiving such power because to accept it would adversely impact the pumpback efficiency and generating capacity of the project. Thus, in water-short periods when hydropower generation is determining the release at most other projects, the Carters release has been controlled by the minimum (240 cfs) release requirement.

There are several approaches which may be taken to account for the operation of Carters Reservoir and its effect downstream. The purpose of any approach is to find a way to account for the presence of the reservoir and its effect on the reliability of supply for withdrawal at Carters. Several approaches are briefly described below.

One approach to understanding releases from Carters is to use a somewhat "idealized" release criterion which bases the release from the re-regulation dam upon the total inflow to the reservoir. When the total inflow to both the main and re-regulation reservoirs is greater than 240 cfs, and the reservoir is at the top of the power pool, the total inflow is released. When less than 240 cfs, then a minimum of 240 cfs is released. The minimum quantity, 240 cfs, is the 7Q10 flow presently required by the State of Georgia at Carters (See <u>Water</u>

Availability and Use Study). The 7Q10 is an average flow for seven consecutive days which has a probability of .10 of not being exceeded during any one year. An examination of the gage records at Carters (02382500) since August 1975 indicates average monthly releases have never been below 260 cfs.

A monthly simulation of re-regulation dam releases based upon total inflow to the main and re-regulation reservoirs was undertaken using spreadsheet calculations. Inflow to the main reservoir was obtained from the Corps of Engineers, Mobile District and is computed from changes in daily main reservoir levels. Inflow to the re-regulation reservoir is estimated to be 1.4 times the gage reading at Talking Rock (02382200). The multiplier 1.4 is the estimated drainage area ratio between the gage location and re-regulation reservoir. Releases were simulated using the "idealized" criterion described above.

The simulated monthly average release and the actual monthly average gage record at Carters were correlated. The statistical correlation can be represented by the correlation coefficient, R. A correlation coefficient of 0.95 was calculated. Using only the low-flow months June through November, the R value is about the same. These analyses indicate that the "idealized" monthly release criterion is reasonably representative of actual reservoir releases.

Another approach to characterizing monthly release as a function of total monthly inflow is through regression analysis. If the release from the re-regulation dam is selected as the dependent variable (Y) and the total reservoir inflow as the independent variable (X), a linear equation can be computed which relates the one variable to the other. Using microcomputer spreadsheet calculations a regression equation $Y = 0 + 1.029X$ was computed. This is only slightly different from the assumption of outflow equally inflow. The determination coefficient, R^2, is useful to indicate the portion of the variance in the streamflow (Y) which is determined by the total inflow (X). For the regression equation the determination coefficient is 0.90. Only approximately 0.10 or 10 percent of the variance is not explained.

The two approaches described above used monthly average flows. If daily flows are used the correlation between streamflow at Carters gage and total reservoir inflow is not as high. A correlation coefficient of 0.27 was computed for a simulation similar to that described above. Observed daily flows at Carters were correlated with simulated releases equal to total daily reservoir inflow. The lower correlation can be explained by the higher variability in daily values.

The operation of Carters Reservoir can also be analyzed indirectly by examining the results of that operation over the past ten years. To do this the gage record at Carters is split into two periods. The first is the period prior to construction of the reservoir (unregulated streamflow), 1898 to 1971. The second period begins after the reservoir is filled. This regulated period is 1975 to 1984. A statistical analysis of these records, together with the combined record, is presented in the following section.

Analysis of Stream Gage Records at Carters

An examination of the 36 years of daily streamflow at Carters (USGS records), with 240 cfs used as a minimum, shows there were approximately 183 days when the daily streamflow fell below 240 cfs. This is shown in Tables 16 and 17. Table 16 shows the number of days each year in different class intervals. The range of streamflow represented by each class interval is shown in Table 17. To illustrate the interpretation of Table 17: during the period of record there were 97 days in class 4 which represents a range of flow from 190 cfs to 230 cfs. The total number of days of record less than 230 cfs is the sum of the totals for each class, or 144. Interpolating linearly for 240 cfs the number of days is approximately 183. These counts are also represented in Table 16. Table 16 also shows which years had streamflows below a selected class interval and the number of those days.

A withdrawal of 79 cfs (51 MGD) from the Coosawattee at Carters (suggested for use in analysis by the Mobile District) would not be permitted if it reduced the flow below 240 cfs. That is to say, 319 cfs is needed in the Coosawattee River at Carters to prevent a shortage in the withdrawal. An analysis of the historical record shows there have been approximately 723 days where the streamflow fell below 319 cfs (Tables 16 and 17). The specific years during the historical record and the number of days each year are shown in Table 16.

The historical record represented by Tables 16 and 17 includes both unregulated and regulated streamflow. The

TABLE 16

STATION NUMBER 02382500

DURATION TABLE OF DAILY VALUES FOR YEAR ENDING SEPTEMBER 30

DISCHARGE-(CFS)
MEAN
COOSAWATTEE RIVER AT CARTERS, GA.

NUMBER OF DAYS IN CLASS

CLASS / YEAR	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
1897				2	19	13	16	34	13	28	45	20	25	41	32	3	7	23	5	17	5	4	3	1	1	4		1	1	1			1		
1898					20	22	11	30	31	39	45	27	29	47	21	2	17	8		4	1	2	1	3	1		1	1	2						
1899							16	13	13	9	26	27	41	60	42	3	19	26	3	15	12	15	7	3	3	1	1	3	2	2		2	1		
1900						5	16	37	27	33	21	19	45	16	34	14	32	20	9	9	15	6	1	2	2	1						1			
1901									7	5	41	15	21	17	77	19	35	34	22	19	17	2	10	8	3	3	1	2		3	1	3			
1902							16	37	7	3	20	28	60	11	40	10	31	37	20	[illegible]	6	2	3	2	2	5	1	2	2	2	1		2		
1903						7	18	21	19	25	17	16	26	25	47	8	19	27	19	24	10	7	8	6	4	6	3					1	2		
1904				3	18	6	17	55	45	59	38	44	26	11	14	6	10	4	4	2	3	1													
1905				37	22	1	11	5	13	20	29	28	52	50	36	5	17	12	9	3	2	2	3	2	1		2		1	2					
1906								13	25	11	5	1	3	22	91	39	52	31	23	12	13	4	1	5	2	2	3	2	1	1		2			
1907								5	10	16	7	18	21	28	58	54	39	40	17	16	16	4	5	3	1	2	3		1					1	
1908							7	12	15	32	29	24	19	13	45	25	48	41	24	10	6	3	5	3		1		2	1	1					
1920								3	11	6	16	12	12	28	42	19	35	34	26	21	22	32	11	10	8	2	3	3	2	6		1		1	
1921											24	36	41	38	32	16	30	49	27	30	11	14			5	5	2	2		1	1			1	
1922								7	18	26	23	23	14	28	28	10	16	21	32	48	24	23	6	2	3	3	1	4	1	1		1	1	1	
1923								11	31	11	16	20	13	28	41	24	30	42	28	22	15	16	4	3	5	2	2				1				
1962							2	45	37	19	17	11	15	16	22	17	30	26	26	37	11	8	7	3	5	1		5	2			1	1	1	
1963							3	21	19	15	31	29	18	27	62	20	34	35	12	12	8	5	3	3	2	3	1						2		
1964							2	18	46	22	18	29	26	20	37	15	23	19	10	18	17	15	11	2	7	3	1		2	2		1		1	1
1965								5	19	20	18	35	37	37	57	18	37	39	9	12	5	7	1	2	1	2		2		1		1			
1966								32	62	34	42	19	15	26	30	13	26	19	7	10	9	4	4		3	1	1	1	4	2			1		
1967								6	4	11	29	35	39	66	64	25	26	20	9	11	5	2	3	6	2			1	1						
1968								3	19	15	15	16	46	27	36	30	46	43	14	23	9	8	4	4	2	1	3	2							
1969								8	43	50	41	23	31	30	53	19	22	18	7	8	4	4	1			1				2					
1970								18	53	54	26	50	48	33	33	14	10	9	3	3		3	6	1	1										
1971							8	8	1	23	45	30	48	36	34	13	26	27	16	22	7	11	3	3	2	1	1								
1975		1	4		8	13	26	54	30	19	25	12	17	24	58	17	36	14	2	2	3														
1976					2	1	8	10	9	15	22	28	17	13	25	12	26	41	12	49	14	28	16	6	11	1									
1977							13	28	35	28	30	40	18	17	20	16	18	16	10	17	7	16	8	13	14	1									
1978						3	8	16	27	19	16	19	16	12	28	25	27	51	17	28	13	28	8	3	1										
1979					4	22	28	10	10	18	5	16	17	27	37	20	28	22	18	29	12	9	11	8	14										
1980					1		6	20	19	23	21	19	28	23	35	11	25	32	17	20	14	16	14	7	15										
1981					1	12	65	75	27	30	24	23	15	21	21	10	15	6	8	10		2													
1982					2	12	32	8	20	20	27	25	34	28	27	12	18	31	16	14	8	9	9	3	9	1									
1983							8	6	5	13	26	18	20	39	53	17	43	44	17	28	6	18	3	1											
1984							1	16	20	13	7	8	20	35	42	12	46	42	22	34	22	13	9	3	1										

TABLE 17
DAILY FLOW-DURATION DATA
STATION 02382500 CARTERS

CLASS	VALUE	TOTAL	ACCUM	PERCT
0	0	0	13148	100.00
1	122	1	13148	100.00
2	140	4	13147	99.99
3	170	42	13143	99.96
4	190	97	13101	99.64
5	230	117	13004	98.90
6	260	338	12887	98.01
7	310	690	12549	95.44
8	360	790	11859	90.20
9	420	790	11069	84.19
10	490	888	10279	78.18
11	570	843	9391	71.43
12	660	973	8548	65.01
13	770	1020	7575	57.61
14	900	1454	6555	49.86
15	1100	599	5101	38.80
16	1200	999	4502	34.24
17	1400	1003	3503	26.64
18	1700	520	2500	19.01
19	1900	642	1980	15.06
20	2300	352	1338	10.18
21	2600	343	986	7.50
22	3100	189	643	4.89
23	3600	121	454	3.45
24	4200	131	333	2.53
25	4900	53	202	1.54
26	5700	30	149	1.13
27	6600	33	119	0.91
28	7800	23	86	0.65
29	9000	27	63	0.48
30	11000	4	36	0.27
31	12000	14	32	0.24
32	14000	11	18	0.14
33	17000	6	7	0.05
34	20000	1	1	0.01

NOTE: CLASS LIMITS IN THE ABOVE TABLE ARE DEFINED AS NUMBER OF DAYS FOR CLASS (I) EQUAL TO OR GREATER THAN VALUE (I) AND LESS THAN VALUE (I+1) FOR CLASS (I+1).

unregulated period extends from 1897 to 1971. The regulated period from 1976 to 1984. Year 1975 is not included in the regulated period because the reservoir was being filled (Figure H-2). The number of days the streamflow was within each class interval is shown in Table 16. For statistical analyses such as flow-duration and low-flow frequency it is appropriate to split the record into the unregulated and regulated periods. These analyses are presented below. For purposes of comparison the entire historical record is also shown.

Flow-duration analysis uses all daily records - both wet and dry seasons. As a consequence flow-duration curves provide statistical information concerning the total streamflow available. Figures H-5 and H-6 show flow duration curves for the unregulated and regulated periods of the historical record. These are compared with each other and with a curve for the entire record in Figure H-7. As can be seen there is relatively little difference in the three curves in the range of 240 cfs to 319 cfs which is of particular interest in this study.

Another useful analysis is low-flow frequency. In this analysis a single low-flow event is selected each year and the probability (frequency) of that event occurring is calculated. This is similar to flood-frequency analysis. The event selected is defined by its duration (number of consecutive days) and average streamflow during the duration. Figure H-8 and H-9 show a family of low-flow frequency curves for the gaging station 02382500 at Carters for unregulated and regulated conditions. As the duration of the low-flow event increases from 7-days to 90-

days the magnitude of the average flow increases.

A duration of 7-days (Figure H-10) and average flow of 240 cfs has a 0.10 probability of not being exceeded. This is the 7Q10 criteria. If 319 cfs were required at Carters, the probability, under regulated conditions, of a low-flow event of 7-day duration and average flow of 319 cfs or less is 0.70. Thus, the probability of such an event occurring in any given year is increased from 0.10 to 0.70. The probability is greatly influenced by the number of years used. If the entire historical record is used, the probability of a low-flow event of 7-day duration and average flow of 319 cfs or less is 0.38. The nine year record of regulated flows is too short for statistical analysis. A better estimate is made using the entire record.

Stochastic Analysis

The preceding analyses utilized historical records of streamflow and reservoir inflow. Based upon these records several probabilities of non-exceedance were estimated. It is not likely, however, that these exact sequences of historical flows will be repeated in the future. To complement the analysis of historical records, stochastic analysis is used. Stochastic analysis is based upon the concept that the historic records are observations of a random (stochastic) process in which the future occurrences of streamflow are governed by probability laws. If the probability laws governing the uncertainty of future streamflows can be assumed, then a probabilistic model of the streamflow can be developed. The development and application of such a model of streamflow is commonly referred to as stochastic analysis, stochastic hydrology or synthetic hydrology. The streamflows generated from such a model are referred to as stochastic or synthetic sequences or flows. The principal advantage of using stochastic sequences is that they are not identical to the historical flow sequences, but consider the randomness of future streamflows as reflected by the probability laws adopted for the stream and used in the stochastic model.

For the Coosawattee River below Carters a stochastic model of the mean monthly streamflow was developed using computer program HEC-4, Monthly Streamflow Simulation. Historical data at three stream gage stations (Carters, Pine Chapel and Resaca) were used to develop the model. Because Carters Reservoir regulated the Coosawattee River after its completion, the inflow to the reservoir as measured by the change in storage in the main reservoir plus the inflow to the re-regulation reservoir was substituted for the observed flows for the period August 1975 to August 1985. The long record stations at Pine Chapel (02383500) and Resaca (02387500) were used to extend and fill-in the record at Carters (02382500).

Using the HEC-4 stochastic model of streamflow at Carters, a sample record of 1000 years of monthly synthetic streamflow data were generated. A statistical analysis of these data resulted in the probability estimates summarized in Table 18. These data give the probabilities that streamflow at Carters will be less than the indicated values for the indicated months. The months, October and September are the most at risk. There is a .047 probability (or 4.7 percent chance) that the mean monthly flow at

TABLE 18
NON-EXCEEDANCE PROBABILITIES
1000 YEARS. MEAN MONTHLY FLOW

MONTH	MEAN MONTHLY FLOWS (CFS)						
	200	240	300	400	500	600	700
OCT	0.0140	0.0470	0.1500	0.3680	0.5480	0.6820	0.7760
NOV	0.0030	0.0080	0.0590	0.1830	0.3270	0.4810	0.5970
DEC	0.0000	0.0000	0.0050	0.0370	0.1060	0.1900	0.2880
JAN	0.0000	0.0010	0.0030	0.0120	0.0430	0.0770	0.1250
FEB	0.0000	0.0000	0.0000	0.0000	0.0040	0.0090	0.0180
MAR	0.0000	0.0000	0.0020	0.0050	0.0120	0.0190	0.0320
APR	0.0000	0.0000	0.0000	0.0000	0.0020	0.0050	0.0130
MAY	0.0000	0.0000	0.0010	0.0040	0.0090	0.0340	0.0690
JUN	0.0000	0.0010	0.0050	0.0200	0.0650	0.1440	0.2440
JUL	0.0010	0.0010	0.0160	0.0440	0.1280	0.2320	0.3830
AUG	0.0000	0.0000	0.0000	0.1230	0.3440	0.5250	0.6610
SEP	0.0090	0.0360	0.1170	0.3040	0.5000	0.6500	0.7530

Carters will not exceed 240 cfs during October. There is a .150 probability (or 15.0 percent chance) that the mean monthly flow at Carters will not exceed 300 cfs during October. The non-exceedance probabilities for these months are plotted for a range of flows in Figure H-11.

The probabilities discussed above provide an estimate of future flows dropping below certain levels. These estimates are based upon the underlying probability laws assumed for the streamflow and the stochastic model used to generate the 1000 years of monthly synthetic data. As such, they are only estimates which are useful together with historical data to attempt to quantify the risk of the unknown future.

Impact Downstream at Resaca and Rome

At Resaca gage (near Calhoun) (02387500) and Rome (02388500) on the Oostanaula River, the State of Georgia 7Q10 streamflow requirements are 340 cfs and 510 cfs respectively (See Water Availability and Use study). An examination of statistics from the entire historical record of daily flows provides an estimate of the number of days of the streamflow being lower than these values. At Resaca the daily flow-duration data indicates approximately 250 days in the 91 year historical record the daily flow fell below 340 cfs (Tables 19 and 20). At Rome a similar analysis shows that 510 cfs has not been exceeded approximately 131 days during the record (Tables 21 and 22).

If an additional 79 cfs were to be withdrawn upstream at Carters the threshold level for the 7Q10 flow would be 419 cfs and 589 cfs at Resaca and Rome respectively. From Tables 20 and

TABLE 19

STATION NUMBER 02387500

DURATION TABLE OF DAILY VALUES FOR YEAR ENDING SEPTEMBER 30

DISCHARGE-(CFS)

MEAN

OOSTANAULA RIVER AT RESACA, GA.

NUMBER OF DAYS IN CLASS

CLASS / YEAR	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
1894					2	2	20	61	44	45	18	13	25	27	24	13	20	14	10	13	6	3	5												
1895				8	16	11	27	3	3	15	13	10	27	24	25	19	35	26	23	17	21	13	4	3	13	1	1	3	1	3					
1896				1	7	9	14	9	19	41	28	4	18	60	48	35	18	18	6	9	5	3	4	6	1	2	1								
1897					1	9	31	14	8	16	43	21	34	33	12	19	24	15	13	13	9	11	5	9	6	5	3	5	3	3					
1898					3	9	17	17	15	23	22	21	50	39	27	17	22	26	12	11	6	6	5	5	3	3	3	2	1						
1899										14	9	5	29	41	27	41	34	35	26	18	19	17	11	8	5	3	5	3	5	6	4				
1900								11	34	18	9	7	42	41	28	15	22	29	18	22	16	14	10	13	6	5	2	1	2						
1901										7	13	11	18	38	42	25	44	24	22	25	19	17	11	11	14	7	1	4	6	6					
1902								8	11	23	31	16	41	51	31	20	18	27	19	17	11	9	6	4	2	2	4	6	3	5					
1903							19	21	19	18	8	8	15	39	41	17	30	17	12	22	16	14	15	6	7	8	2	4	3	3	1				
1904			5	4	5	14	29	37	52	44	24	17	28	25	26	9	14	5	10	3	4	4	4	3											
1905			6	36	6	8	10	18	9	14	6	15	29	27	52	28	27	11	16	9	6	12	5	3	2	3	2	4	1						
1906								4	20	21	5	7	7	14	37	26	[illegible]	30	35	24	19	12	9	13	5	8	7	3	1						
1907									10	11	5	13	11	27	47	43	65	30	22	16	11	12	11	8	7	6	5	1		2		2			
1908					7	3	17	11	7	25	11	12	18	32	18	24	43	43	24	19	14	6	11	8	5	3	3	2							
1909						2	20	19	10	7	9	14	13	15	31	17	20	30	32	24	25	18	12	11	5	10	7	5	5	1	1		2		
1910							7	24	11	26	7	16	27	41	41	22	29	26	21	17	9	14	12	5	4	3	2	1							
1911						4	17	23	5	11	39	27	40	40	45	21	27	22	11	4	4	3	3	6	5	1	4	2	1						
1912					7	4	3	5	13	23	19	4	11	15	39	31	32	24	23	26	18	21	14	8	11	7	4	1	1	2					
1913							9	25	19	42	14	10	22	24	24	22	29	30	18	18	13	10	10	10	3	4	1	4	2	2					
1914						7	27	55	54	36	20	19	26	32	25	15	15	8	12	4	2	3	3		1	1									
1915					1	4	13	40	12	20	11	10	28	36	38	22	28	23	18	14	13	8	4	8	5	3	2	3	1						
1916									3	6	39	3	36	51	39	30	38	15	33	13	9	8	10	10	4	2	5	3	3	2	2				
1917								8	12	13	24	16	20	13	74	12	50	4	20	12	21	14	9	10	11	3	4	2	5	3	3	2			
1918						23	15	51	32	32	26	22	14	16	26	14	26	14	10	7	12	4	4	4	4	3	2	1	3						
1919					8	10	3	6	3	15	5	4	14	47	30	18	32	27	36	22	10	16	10	11	15	11	5	5	2						
1920								7	6	8	5	12	9	29	28	20	27	19	41	41	24	19	12	13	6	16	7	6	5	3		1	2		
1921										13	12	9	40	67	24	16	40	34	35	19	12	10	3	6	8	5	2	1	2	3	1		2	1	
1922								5	21	27	19	11	8	31	29	18	20	20	32	31	19	16	14	7	11	9	6	3	2	3	1		2		
1923								32	20	9	13	6	8	26	30	18	30	26	30	27	25	13	11	14	13	9	2	1							
1924									21	59	20	7	15	12	28	23	32	37	23	25	11	9	12	10	7	6	1	4	2	2					
1925		4	27	7	15	14	12	63	17	27	13	7	14	25	25	21	18	14	8	8	5	2	4	3	5	4	1	1	1						
1926				1	2	5		11	8	32	39	21	20	32	25	24	33	34	18	18	10	12	11	5	3		1								
1927								22	15	20	16	17	16	41	39	17	35	21	28	17	13	10	13	3	5	5	5	3	2	2					
1928							4	14	6	19	2	4	7	11	40	27	58	36	29	33	22	13	9	8	9	8	2	5							
1929											11	18	64	38	29	22	25	21	19	28	20	10	13	10	8	7	7	10	5						
1930							12	23	4	27	15	21	26	26	26	16	34	36	29	17	16	10	7	3	4	1	3	1	2	2	4				
1931					1	6	8	35	21	36	30	26	39	37	23	24	15	13	14	8	6	4	4	6	4	3	2								
1932					28	15	8	9	8	7	10	5	13	36	18	32	33	31	20	16	14	12	5	14	8	6	7	6	5						
1933								2	8	14	20	16	31	29	21	20	18	48	22	28	15	10	8	14	11	8	6	2	3	7	1	1	2		

TABLE 19 (continued)

1934				3	55	34	22	39	29	33	33	33	19	18	8	5	10	2	3	4	3	3	3	2		1	2	1				
1935	4	7	8	15	11	11	29	36	20	33	32	20	13	25	29	8	7	9	14	10	7	7	4	4	2							
1936	20	4	8	9	14	28	39	21	13	26	21	12	13	23	18	17	17	8	6	4	5	2	4	10	3	7	7	3		4		
1937					30	20	22	27	24	25	25	15	25	26	24	10	15	12	9	7	7	7	8	8	5	2	3	1				
1938					5	21	42	14	18	37	39	33	27	26	20	13	13	11	7	4	3	11	3	1	1	5		1		2		
1939					29	24	34	29	17	20	28	33	23	17	32	12	15	8	6	8	7	6	6	5	5	1						
1940			4	64	20	28	39	26	21	24	19	16	20	21	18	10	6	6	8	5		1	2									
1941			29	28	35	39	22	36	38	38	30	21	11	11	6	3	4	5	2	4	1	2										
1942		11	12	10	8	7	20	32	30	47	39	27	13	20	19	14	8	19	8	8	4	2	1	3	1	2						
1943				2	7	14	28	32	22	27	29	27	31	35	23	17	11	12	7	6	5	9	6	3	5	1	4		1	1		
1944				11	23	66	25	36	15	20	23	16	18	8	9	9	13	14	12	4	9	6	8	6	5	5	3	1	1			
1945				20	33	23	30	27	20	29	20	27	19	25	22	17	14	12	4	5	5	3	2	4	4							
1946					7	19	36	15	16	16	16	19	19	17	27	34	27	18	22	11	8	9	5	6	4	5	1	3	2	2	1	
1947			1	14	11	25	43	28	10	23	32	22	27	29	19	16	14	7	8	3	5	4	6		1	1	3	1	1	1	1	1
1948			5	10	30	19	26	49	42	30	22	24	11	10	17	9	9	12	4	8	6	3	2		5	1	2	2				
1949				4	20	1		2	16	24	37	31	17	29	32	23	31	25	9	13	9	10	10	4	1	2	2	3		2		
1950								6	14	47	42	32	41	28	31	24	23	18	15	12	7	9	4	2	4	2	2		2			
1951					14	14	16	45	32	33	36	30	22	20	21	15	19	13	11	4	6	5	2		1	1	1	1		1	1	1
1952					10	34	26	32	12	19	29	21	10	18	34	22	27	12	9	4	10	7	8	2	3	7	2					
1953				10	57	20	19	32	20	24	15	20	23	20	16	16	12	10	10	6	7	5	6	5	4							
1954		4	20	31	37	27	22	14	12	21	28	18	20	24	21	14	12	6	6	5	5	4	2	3	1		3	4	1			
1955		24	26	25	20	6	14	21	19	29	43	18	17	24	21	12	8	10	2	6	6	5	3	1	3	2						
1956				28	42	25	24	30	29	31	27	13	10	15	17	12	14	6	7	4	3	4	8	5	5	7						
1957			8	22	57	21	13	15	13	26	20	21	15	22	32	19	17	8	7	9	2	3	2		2	2	4	2	3			
1958						7	14	36	23	28	26	19	14	39	42	27	19	15	10	15	7	6	5	4	3	4	2					
1959					7	21	64	42	27	26	36	33	20	24	20	11	6	5	5	2	6	5	3	2								
1960				4	17	24	23	22	34	28	27	23	25	29	15	15	31	17	8	9	8	2		2	1	2						
1961						10	39	37	13	27	41	37	32	35	10	13	19	9	7	6	2		5	4	1	4	1	3	2			
1962				2	24	37	32	27	11	21	31	19	8	16	17	29	20	16	8	3	6	2	6	4	5	6	7	4	3	1		
1963					8	26	18	20	17	28	34	29	32	34	26	21	21	9	10	7	2	2	4	2	4	3	6	2				
1964					40	28	12	21	24	32	27	15	12	18	9	17	25	15	12	5	9	7	10	6	4	8	5	3	2			
1965					2	13	19	36	33	28	34	27	26	26	30	19	24	12	8	7	5	1	5	3	1	3	2	1				
1966					29	51	33	33	21	38	31	22	18	13	20	8	10	4	6	4	2	1	5	3	4	4	4	1				
1967						2	4	2	17	50	59	45	35	45	28	13	11	14	7	10	2	6	9	4	2							
1968					1	15	19	17	10	23	45	30	24	29	31	23	25	14	15	5	9	8	6	6	5	4	2					
1969					18	36	29	39	29	34	30	33	18	21	20	9	10	10	7	6	5	2	2	2	1	1	3					
1970					5	50	49	33	12	32	36	35	33	20	20	8	9	2	2	2	4	4	4	5								
1971				6	8	2	11	28	27	53	40	32	17	22	13	16	23	18	9	6	5	7	11	9	2							
1972						10	40	35	23	24	22	17	15	24	24	34	32	18	8	8	6	5	2	4	2	5						
1973						6	3	14	14	10	38	23	31	21	28	31	40	23	19	8	10	8	11	7	4	2	3	2	1			
1974						13	8	42	39	27	25	10	14	34	22	13	15	17	10	8	10	11	15	15	3	6						
1975			1	7	41	14	12	26	19	25	40	33	23	25	10	13	16	5	7	4	5	11	4	10	4	2						
1976					3	13	15	7	9	17	19	42	22	27	37	28	24	26	23	14	9	8	10	4	6	3						
1977				11	10	24	28	30	22	29	36	22	14	18	14	19	21	18	18	9	4		1	3	2	4	6	2				

TABLE 19 (continued)

1978	3	7	19	22	14	14	12	13	21	30	37	28	36	17	19	18	14	6	8	5	12	7	3			
1979	37	12	4	6	6	2	12	19	33	21	31	29	24	18	17	10	16	16	12	12	10	5	5		4	4
1980		4	20	11	5	22	10	15	34	27	22	34	32	22	17	18	16	10	10	9		7	8	7	3	3
1981			9	37	69	45	25	41	40	22	19	10	10	9	5	4	4	5	3	3	5					
1982		2	3	22	30	22	16	33	34	39	17	17	26	16	14	12	8	14	8	10	10	2	2	3	3	2
1983			7	10	13	17	20	25	17	23	25	33	34	34	25	18	15	11	6	6	9	11	5	1		
1984			12	9	29	2	5	8	33	24	24	22	30	18	33	19	18	21	10	11	12	11	7			

TABLE 20
DAILY FLOW-DURATION DATA
STATION 02387500 RESACA

CLASS	VALUE	TOTAL	ACCUM	PERCT
0	0	0	33237	100.00
1	180	4	33237	100.00
2	210	38	33233	99.99
3	250	81	33195	99.87
4	300	159	33114	99.63
5	350	321	32955	99.15
6	410	703	32634	98.19
7	490	1571	31931	96.07
8	580	1633	30360	91.34
9	680	2095	28727	86.43
10	810	1998	26632	80.13
11	960	1541	24634	74.12
12	1100	2377	23093	69.48
13	1300	2862	20716	62.33
14	1600	2579	17854	53.72
15	1900	1953	15275	45.96
16	2200	2430	13322	40.08
17	2600	2139	10892	32.77
18	3100	1710	8753	26.34
19	3600	1592	7043	21.19
20	4300	1159	5451	16.40
21	5100	908	4292	12.91
22	6000	708	3384	10.18
23	7100	602	2676	8.05
24	8400	525	2074	6.24
25	9900	472	1549	4.66
26	12000	343	1077	3.24
27	14000	257	734	2.21
28	16000	204	477	1.44
29	19000	150	273	0.82
30	23000	68	123	0.37
31	27000	25	55	0.17
32	32000	24	30	0.09
33	38000	4	6	0.02
34	44000	2	2	0.01

NOTE: CLASS LIMITS IN THE ABOVE TABLE ARE DEFINED AS NUMBER OF DAYS FOR CLASS (I) EQUAL TO OR GREATER THAN VALUE (I) AND LESS THAN VALUE (I+1) FOR CLASS (I+1).

TABLE 21

STATION NUMBER 02388500

DURATION TABLE OF DAILY VALUES FOR YEAR ENDING SEPTEMBER 30

DISCHARGE-(CFS)

MEAN

OOSTANAULA RIVER AT ROME, GA.

NUMBER OF DAYS IN CLASS

CLASS / YEAR	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
1940		2	26	49	43	21	29	24	27	16	11	17	8	12	11	21	10	8	9	1	9	4	4	1	1	1	1								
1941			26	38	31	26	26	18	49	25	25	26	15	12	15	4	5	6	3	4	2	3	1	5											
1942		16	9	18	7	17	24	25	44	33	19	21	16	11	10	14	10	16	9	10	10	5	5	3	4	2	4	2	1						
1943					10	22	18	30	24	21	17	24	24	25	29	20	15	11	10	10	6	5	4	5	7	4	11	4	3	3	3				
1944				18	20	36	39	36	20	26	17	16	9	12	7	9	5	8	5	15	10	4	5	5	5	3	16	5	6	7	2				
1945		1	4	41	20	27	21	18	31	16	19	13	16	17	21	21	15	12	10	9	5	7	4	3	2	1	9	2							
1946				4	11	20	31	12	19	15	12	15	13	12	13	21	21	18	21	18	11	23	10	7	6	3	6	4	4	4	2	5	2	1	1
1947			15	11	17	41	22	15	24	13	16	20	22	16	22	18	14	12	13	13	6	1	4	7	5	3	3		1	3	3		2	2	1
1948			10	8	30	28	36	22	38	24	18	14	15	19	9	13	13	8	9	6	9	4	6	4	10	1	2	1	4	3	2				
1949					30	3		7	7	25	24	17	22	22	17	34	19	19	16	20	10	14	8	11	9	6	8	4	3	6	1	1	2		
1950							6	1	18	28	26	39	27	22	25	27	21	24	15	18	16	11	10	6	8	4	1	1	2	4	5				
1951					13	15	12	18	50	28	37	22	17	17	22	17	12	11	14	9	16	5	5	6	6	2	2	1	1		1	1	2	3	
1952					14	28	26	16	24	12	13	31	17	16	15	18	24	18	18	15	7	5	5	9	9	5	2	5	11	3					
1953			1	18	47	20	20	14	32	22	9	13	17	17	16	17	9	11	16	13	7	9	4	6	11	2	9	5							
1954		4	14	43	28	27	18	14	13	11	17	17	15	16	22	22	15	15	7	8	7	4	5	4	3	1	2	1	1	6	5				
1955		6	23	44	20	12	10	17	23	24	17	23	17	13	12	21	21	11	6	5	4	3	7	6	7	4	5	1	1	2					
1956			1	8	30	39	32	21	41	33	20	19	8	5	7	13	13	9	10	8	5	3	6	5	4	3	10	11	2						
1957		2	9	32	34	32	12	9	16	15	15	22	14	12	17	18	27	14	16	10	7	4	4	4	3		2	1	2	8	1	3			
1958						8	16	15	30	25	18	17	15	12	15	28	32	28	19	21	17	6	12	9	5	4	6	5	2						
1959				1	10	32	47	31	43	20	20	19	21	16	20	22	11	14	2	8	4	3	5	5	7	2	2								
1960			2	10	21	17	25	14	35	27	9	18	16	14	21	21	17	13	18	19	14	11	10	5	3	1	1	4							
1961						2	26	32	33	22	22	37	34	26	24	28	10	12	12	8	3	4	4	3	4	2	3	4	2	1	4	3			
1962			2	3	29	37	26	21	18	18	19	22	13	6	8	16	23	16	16	11	7	8	1	3	6	4	8	1	1	12	9	1			
1963					2	18	26	16	23	21	26	23	24	18	35	21	20	24	11	15	4	4	4	2	5	1	1	2	4	14	1				
1964				2	20	40	21	17	28	24	14	21	14	9	12	11	8	17	12	19	6	2	6	11	8	1	8	5	13	6	11				
1965					6	14	28	27	28	27	24	20	21	20	19	23	19	17	18	11	10	4	6	5	5	1	3		2	6	1				
1966				3	26	68	33	29	17	28	28	23	17	8	12	11	8	7	6	4	3		3	6	1	3	4	3	6	8	1				
1967					1	3	4	6	37	36	30	30	32	40	28	25	8	20	8	10	6	6	3	5	10		8	1							
1968				1	13	16	19	6	14	23	24	20	30	23	20	25	25	19	15	13	5	9	11	3	6	3	10	2	4	7					
1969					13	33	28	43	39	20	14	26	18	18	19	24	10	9	9	7	8	4	6	4	1		5		3	4					
1970					7	26	55	36	44	14	17	31	26	22	22	17	9	10	5	2	2	1	3		7	1	5	3							
1971				5	10	2	10	19	33	51	22	29	23	19	18	16	9	17	14	18	8	6	3	3	6	3	14	7							
1972					4	27	32	26	26	20	15	18	15	13	15	20	22	28	22	22	7	5	6	8	1	2	5	4	3						
1973						4	8	18	14	21	19	23	19	25	12	23	14	29	23	17	22	15	7	10	9	6	11	4	9	3					
1974						12	12	35	29	23	33	16	13	14	34	19	11	11	9	13	9	7	7	6	14	8	19	2	9						
1975				1	35	18	17	13	25	31	22	24	27	18	19	19	12	12	11	4	6	8	5	5	8	3	9	7	6						
1976				3	5	5	9	9	18	8	7	12	29	24	37	40	17	19	18	25	18	14	4	13	7	3	12	3	5	2					
1977				4	13	31	23	26	40	24	19	19	19	7	12	19	14	15	14	13	13	9	6	5	1	1	1	1	4	5	3	3	1		
1976			1	9	13	19	13	6	17	13	12	14	24	20	25	30	27	25	16	15	15	8	9	8	8	3	7	6	2						
1979		1	28	21	4	3	5	6	12	19	8	22	12	17	26	23	15	19	17	14	9	18	11	18	6	7	4	4	5	2	7	2			

TABLE 21 (continued)

1980		16	15	9	14	14	10	16	15	19	8	20	22	19	24	23	17	23	18	5	9	8	10	1	3	7	9	8	4	
1981		9	40	37	51	30	28	32	24	18	21	5	13	10	7	7	8	2	1	10	1	2	4	2	3					
1982	2	13	20	21	7	25	27	25	24	27	15	13	17	11	16	18	14	10	15	5	5	6	8	11	4	2	3	4	4	1
1983		2	5	18	13	21	36	11	4	15	12	21	23	27	30	26	20	15	10	13	1	4	13	1	15	3	6			
1984		8	14	18	10	2	11	4	26	21	17	13	17	22	19	27	23	13	16	16	9	16	13	5	13	9	3	1		

TABLE 22
DAILY FLOW-DURATION DATA
STATION 02388500 ROME

CLASS	VALUE	TOTAL	ACCUM	PERCT
0	0	0	16437	100.00
1	408	32	16437	100.00
2	470	173	16405	99.81
3	540	443	16232	98.75
4	630	731	15789	96.06
5	720	952	15058	91.61
6	830	960	14106	85.82
7	960	859	13146	79.98
8	1100	1215	12287	74.75
9	1300	990	11072	67.36
10	1500	847	10082	61.34
11	1700	961	9235	56.18
12	2000	827	8274	50.34
13	2300	737	7447	45.31
14	2600	835	6710	40.82
15	3000	898	5875	35.74
16	3500	706	4977	30.28
17	4000	705	4271	25.98
18	4600	584	3566	21.69
19	5300	544	2982	18.14
20	6200	403	2438	14.83
21	7100	315	2035	12.38
22	8200	254	1720	10.46
23	9400	270	1466	8.92
24	11000	276	1196	7.28
25	13000	124	920	5.60
26	14000	277	796	4.84
27	17000	137	519	3.16
28	19000	143	382	2.32
29	22000	132	239	1.45
30	26000	70	107	0.65
31	30000	20	37	0.23
32	34000	9	17	0.10
33	39000	6	8	0.05
34	45000	2	2	0.01

NOTE: CLASS LIMITS IN THE ABOVE TABLE ARE DEFINED AS NUMBER OF DAYS FOR CLASS (I) EQUAL TO OR GREATER THAN VALUE (I) AND LESS THAN VALUE (I+1) FOR CLASS (I+1).

22, the number of days these flows have been exceeded during the historical record is 678 (Resaca) and 446 (Rome). The years during which the flows were exceeded are shown in Tables 19 and 21.

Using low-flow frequency analysis Figures H-12 and H-13 show the probability of low-flow events of seven consecutive days being equal to or less than the average flow indicated. A flow of 340 cfs at Resaca has a probability of approximately 0.12 of being equal to or less. A flow of 419 cfs has a probability of 0.24. At Rome (Figure H-13) the 7-day low-flow probabilities are 0.16 and 0.30 for 510 and 589 cfs respectively. It should be noted that in the above analyses the probabilities for 340 cfs and 510 cfs are slightly different from the 7Q10 criterion of 0.10. This is probably due to the additional daily records at the gages which have become available since the 7Q10 flow was computed. See Table 2 for more current estimates.

Assessment of Water Supply Availability

The foregoing analyses describe the hydrologic impact of withdrawing 51 MGD from the Coosawattee river near Carters. It is clear from these analyses that 51 MGD will not be available at all times. If withdrawals had been made during the 36 years of the historical record there would have been an estimated 723 days where the streamflow would not have been adequate. In recent times with the regulation of flow by Carters Dam the USGS data show there have been approximately 265 days when the streamflow was less than that required for full withdrawal. Another way to assess supply is by examining the change in probability of shortage. To accomodate a withdrawal of 51 MGD the probability of the 7-day duration low-flow event would increase from 0.10 to 0.38. Stochastic analyses of monthly flows shows a similar increase in probability.

For those times when withdrawals cannot be made from the Coosawattee River, a secondary supply source must be found. The preceding analysis shows that such times will be infrequent, therefore, the selection of a secondary source should reflect its expected infrequent use. Some alternatives are: groundwater pumping, storage, interbasin transfer, purchase from other suppliers, conservation, curtailment of operation, or combination of these. Several factors govern the selection of the secondary source. One is availability of the alternative supply. Groundwater, for example, is in limited supply in the region. A second factor is reliability. A greater capacity system will be required to insure that 51 MGD is always available than if some shortages are tolerated when the Coosawattee is low. Because withdrawal from the Coosawattee River is being examined as an alternative to Dalton Lake, the reliability should be the same in both projects. A third factor is cost. The minimum cost alternative which is available and which provides the necessary reliability should be selected.

The selection of a secondary supply source will be included in the work related to the location, size and cost of the facilities necessary for withdrawal and transport of water from the Coosawattee River. This work is being done by the Mobile District, Corps of Engineers.

APPENDIX A

COOSA BASIN MAPS

APPENDIX A

COOSA BASIN MAPS

Contents

Acknowledgement: All figures in this Appendix were adapted from Water Availability and Use, Georgia Department of Natural Resources, 1982.

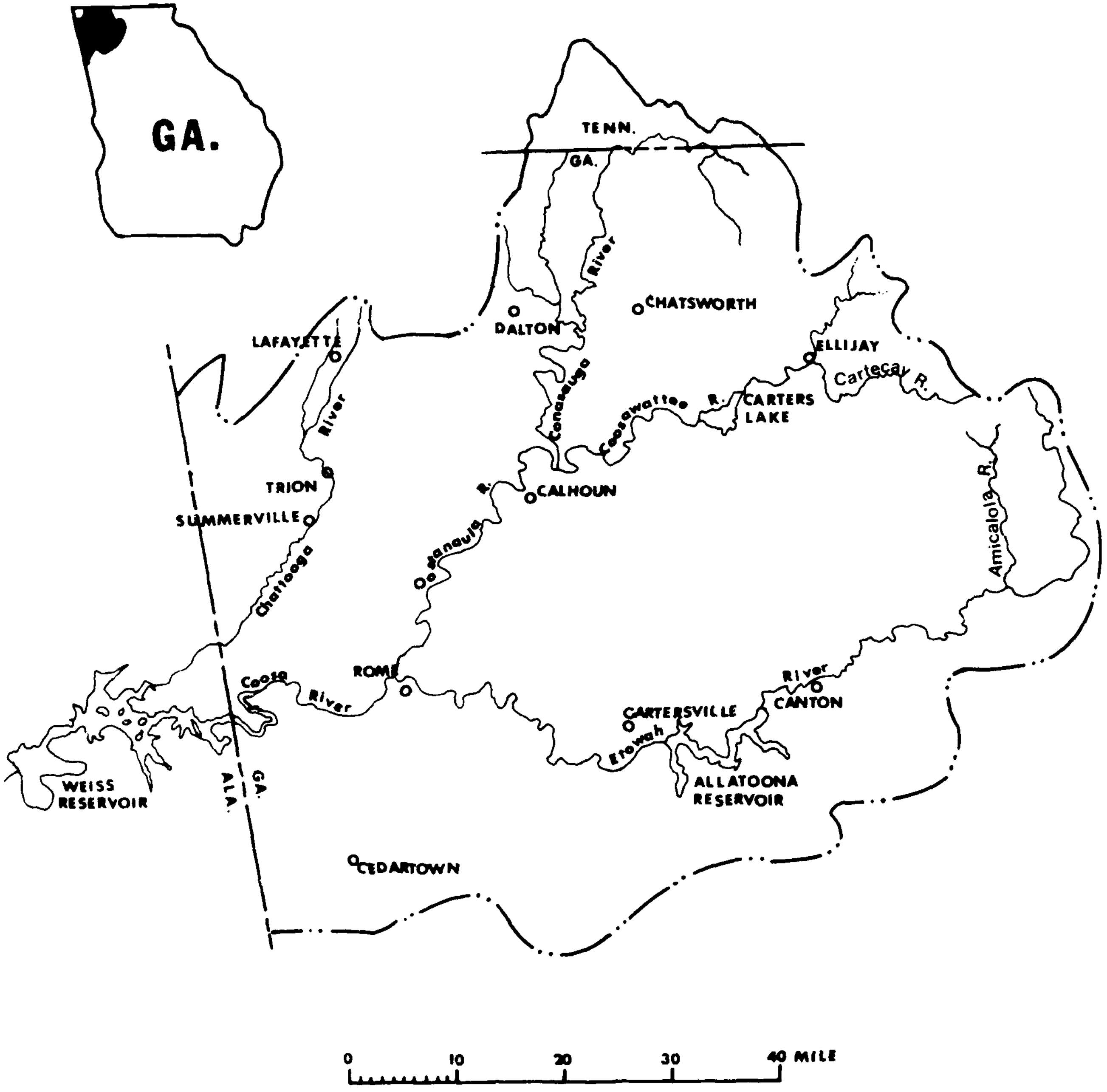


FIGURE A-1

COOSA RIVER BASIN

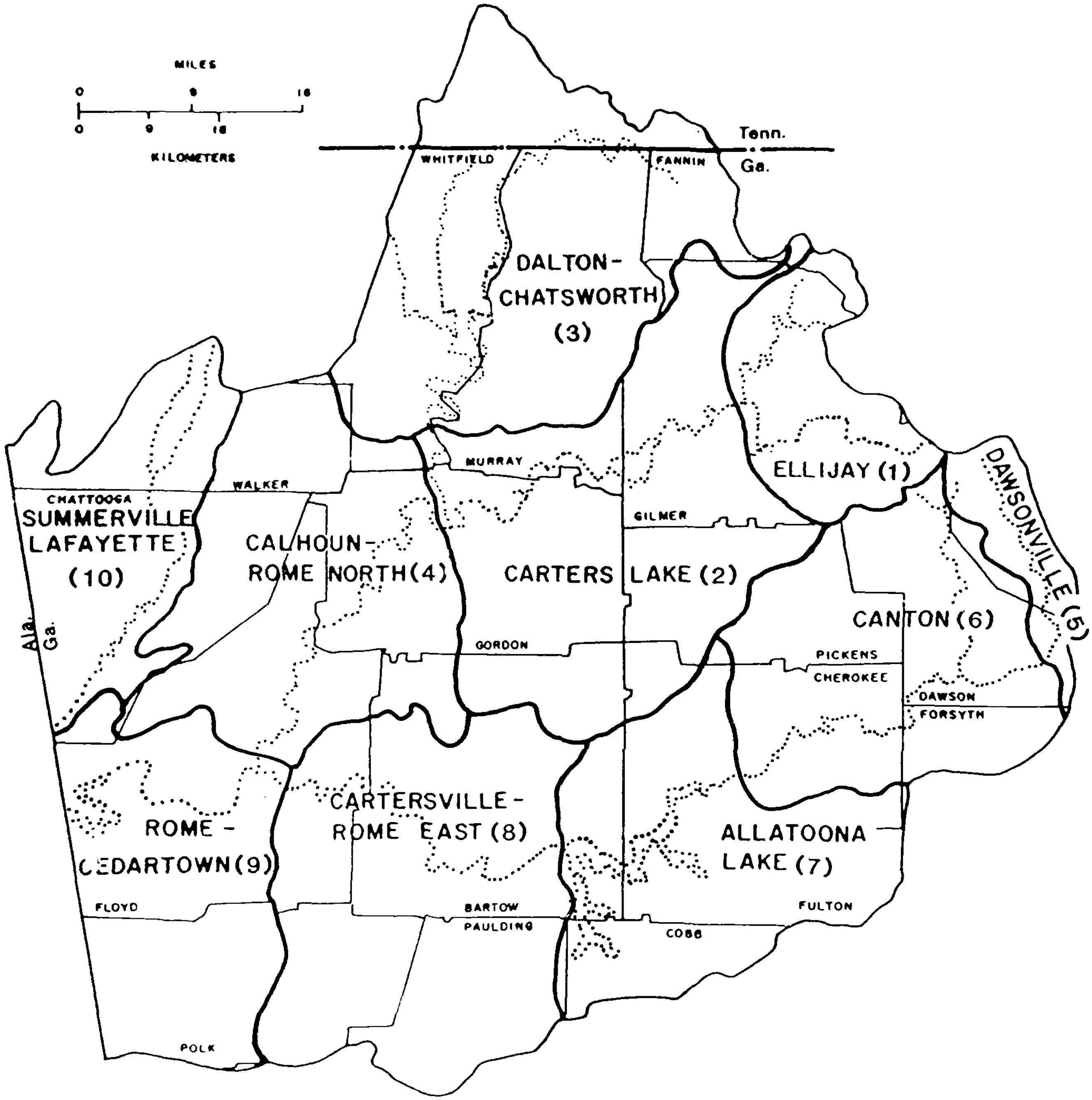
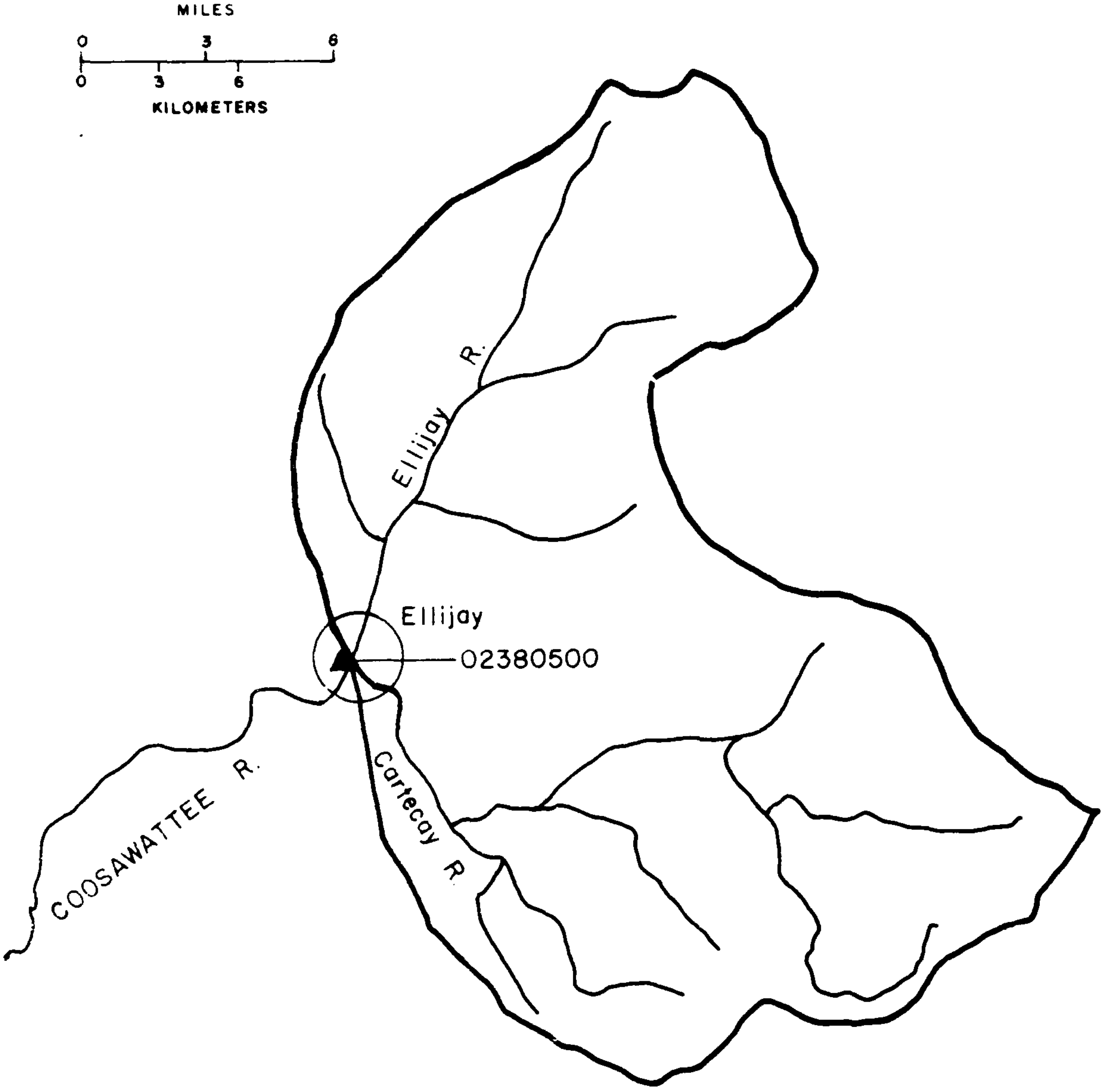


FIGURE A-2
HYDROLOGIC UNIT
LOCATION MAP



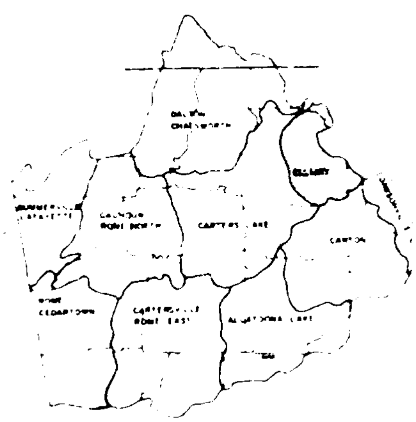


FIGURE A-3
ELLIJAY 1
HYDROLOGIC UNIT

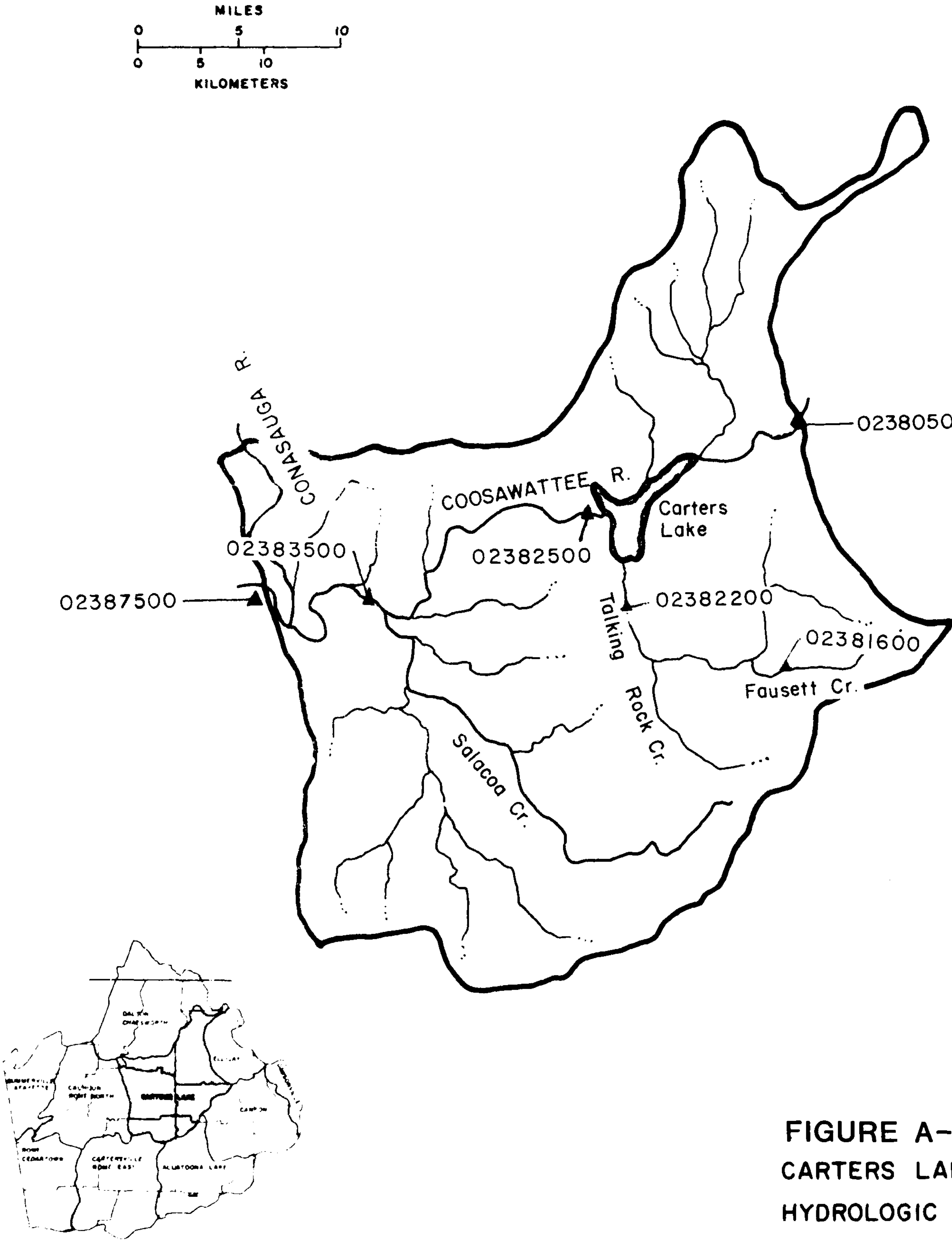


FIGURE A-4
CARTERS LAKE 2
HYDROLOGIC UNIT

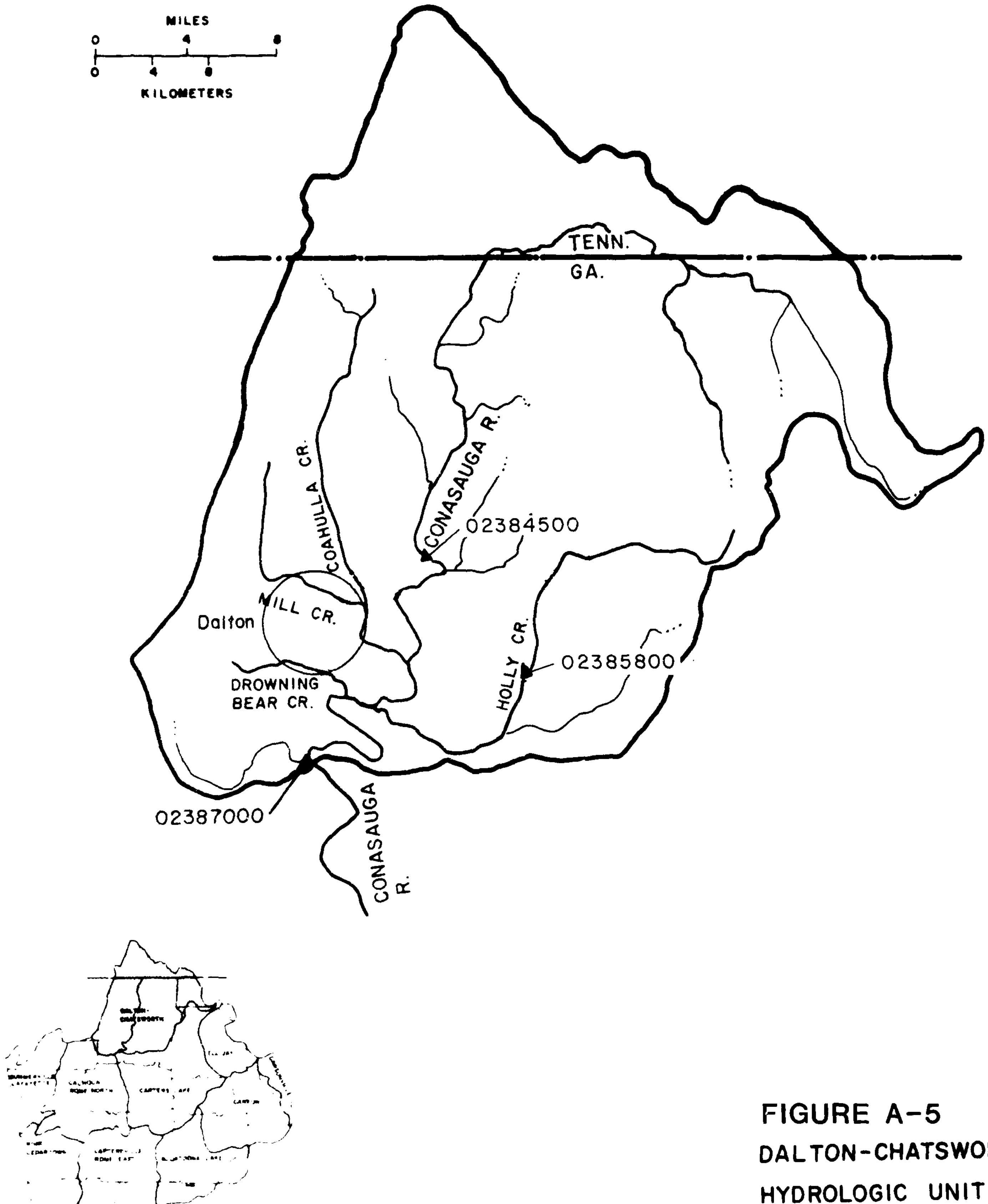
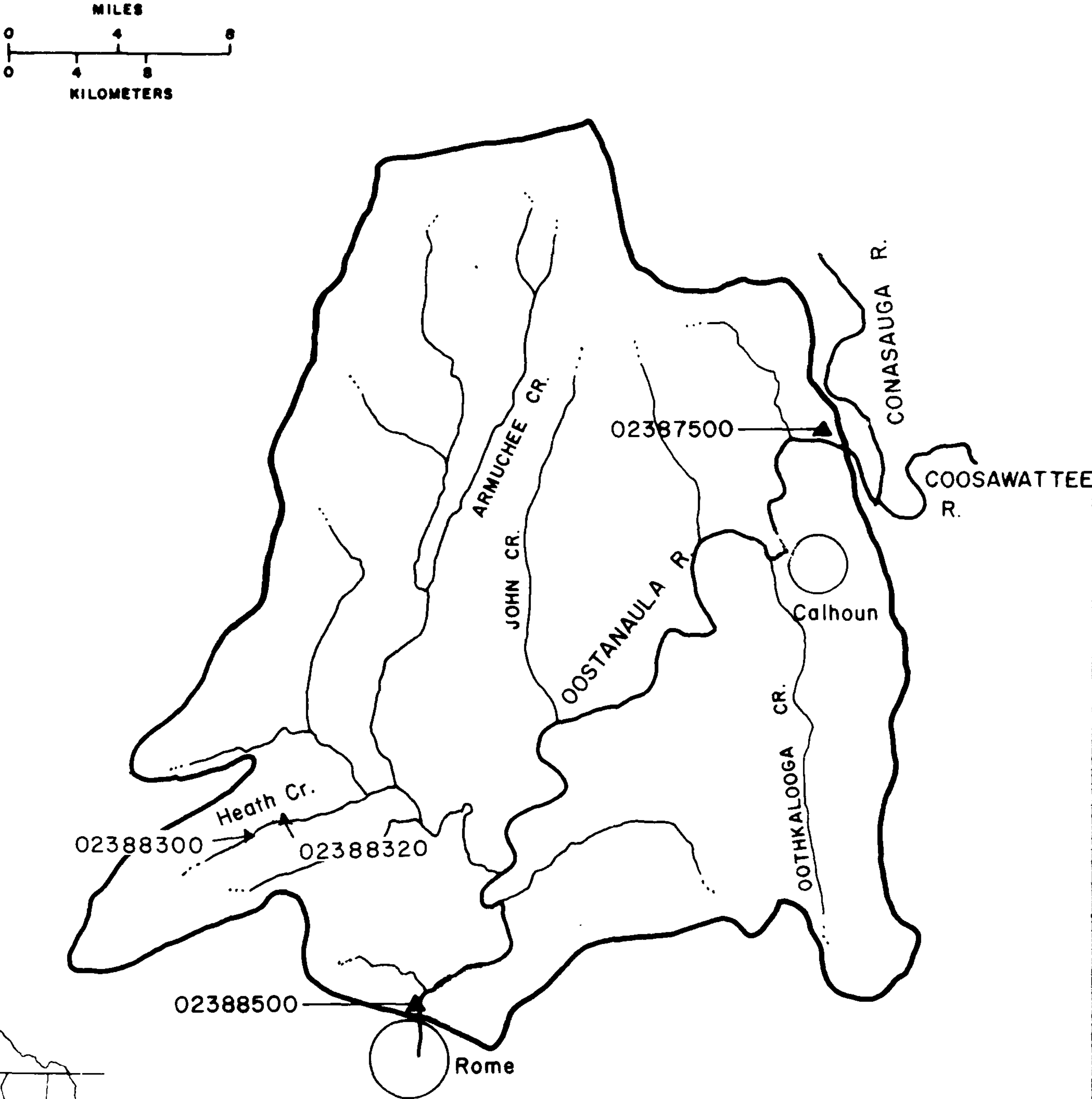


FIGURE A-5
DALTON-CHATSWORTH 3
HYDROLOGIC UNIT



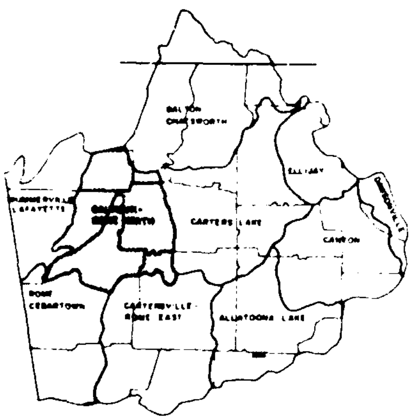
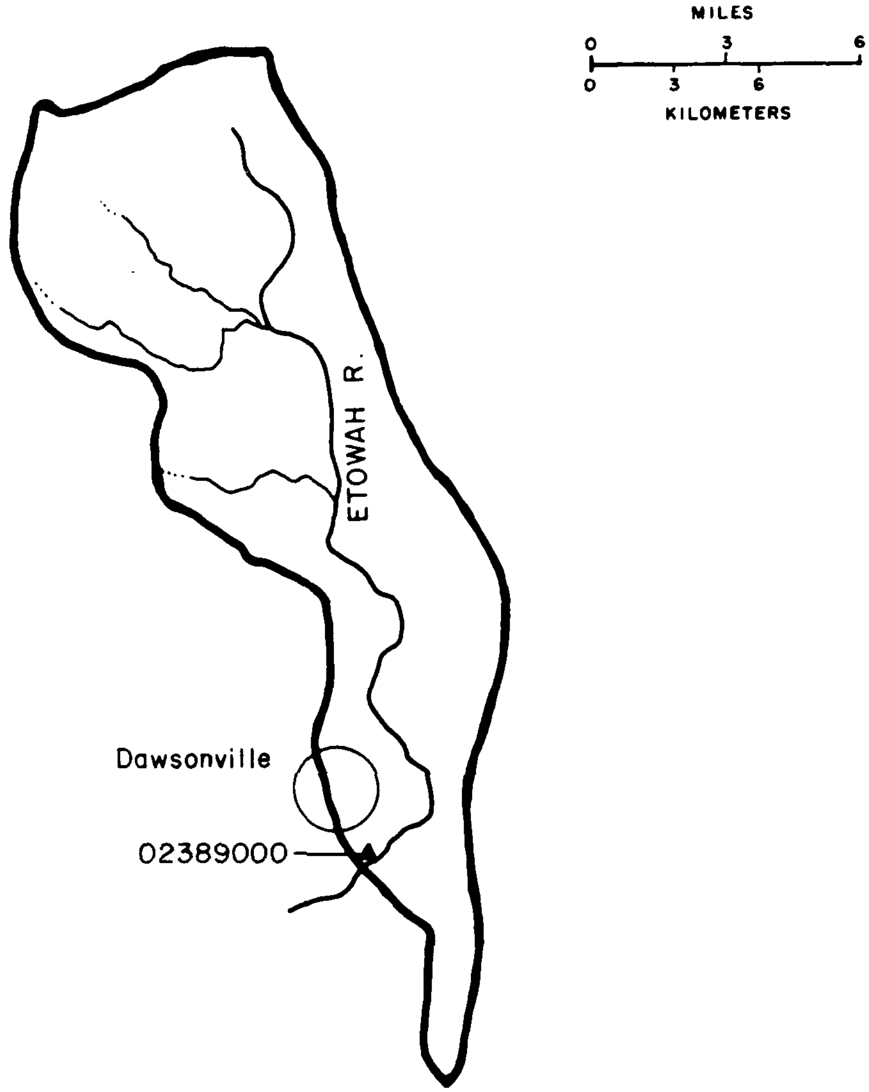


FIGURE A-6
CALHOUN-ROME NORTH 4
HYDROLOGIC UNIT



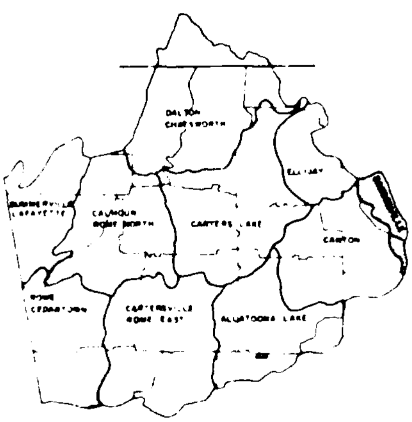
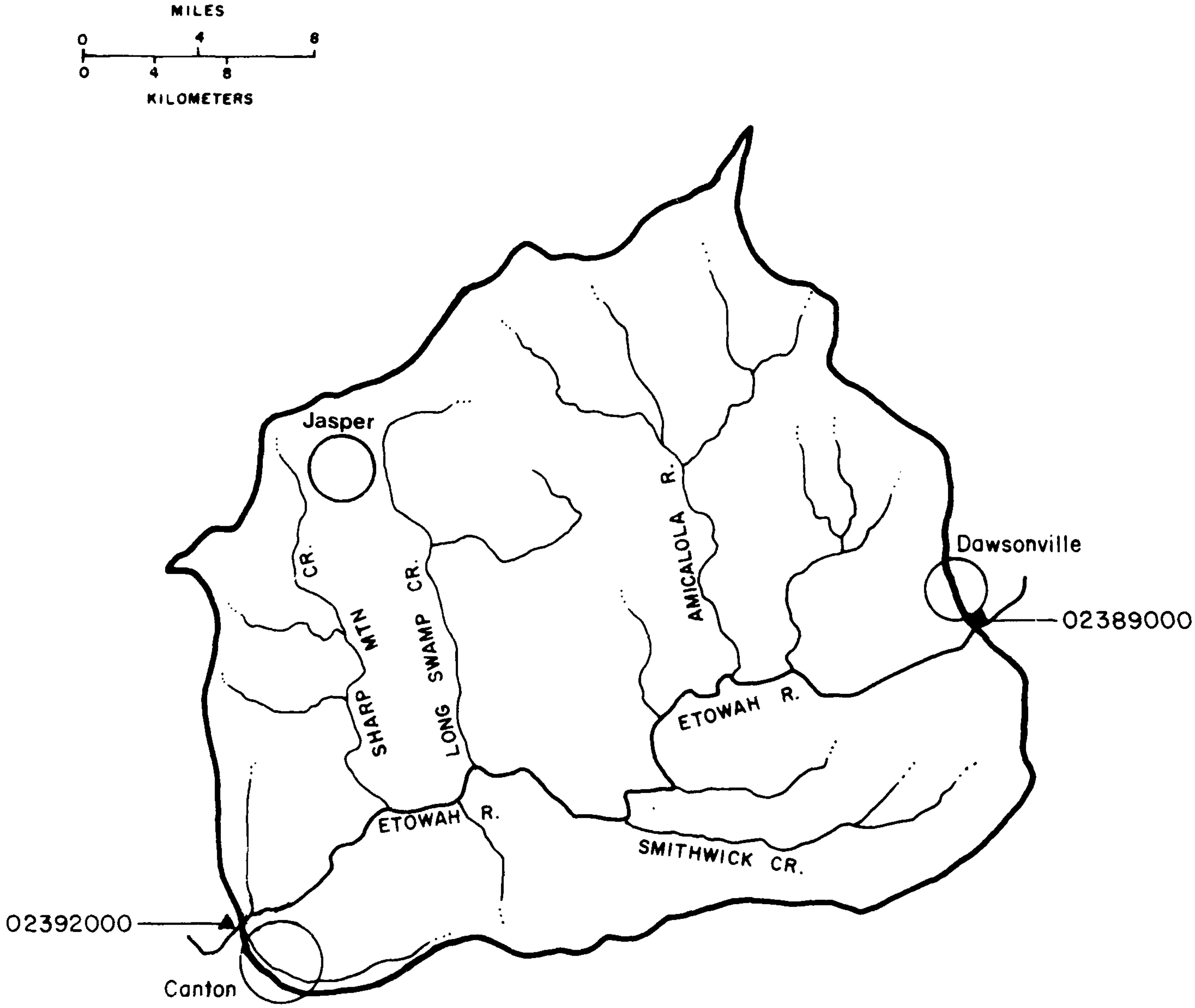


FIGURE A-7
DAWSONVILLE 5
HYDROLOGIC UNIT



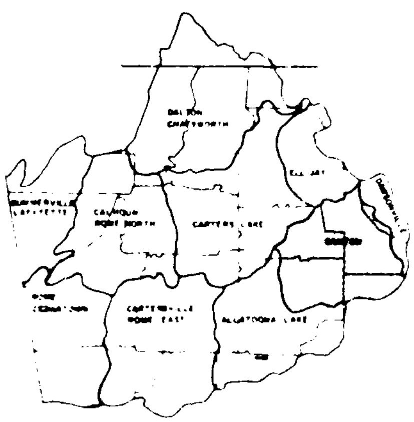


FIGURE A-8
CANTON 6
HYDROLOGIC UNIT

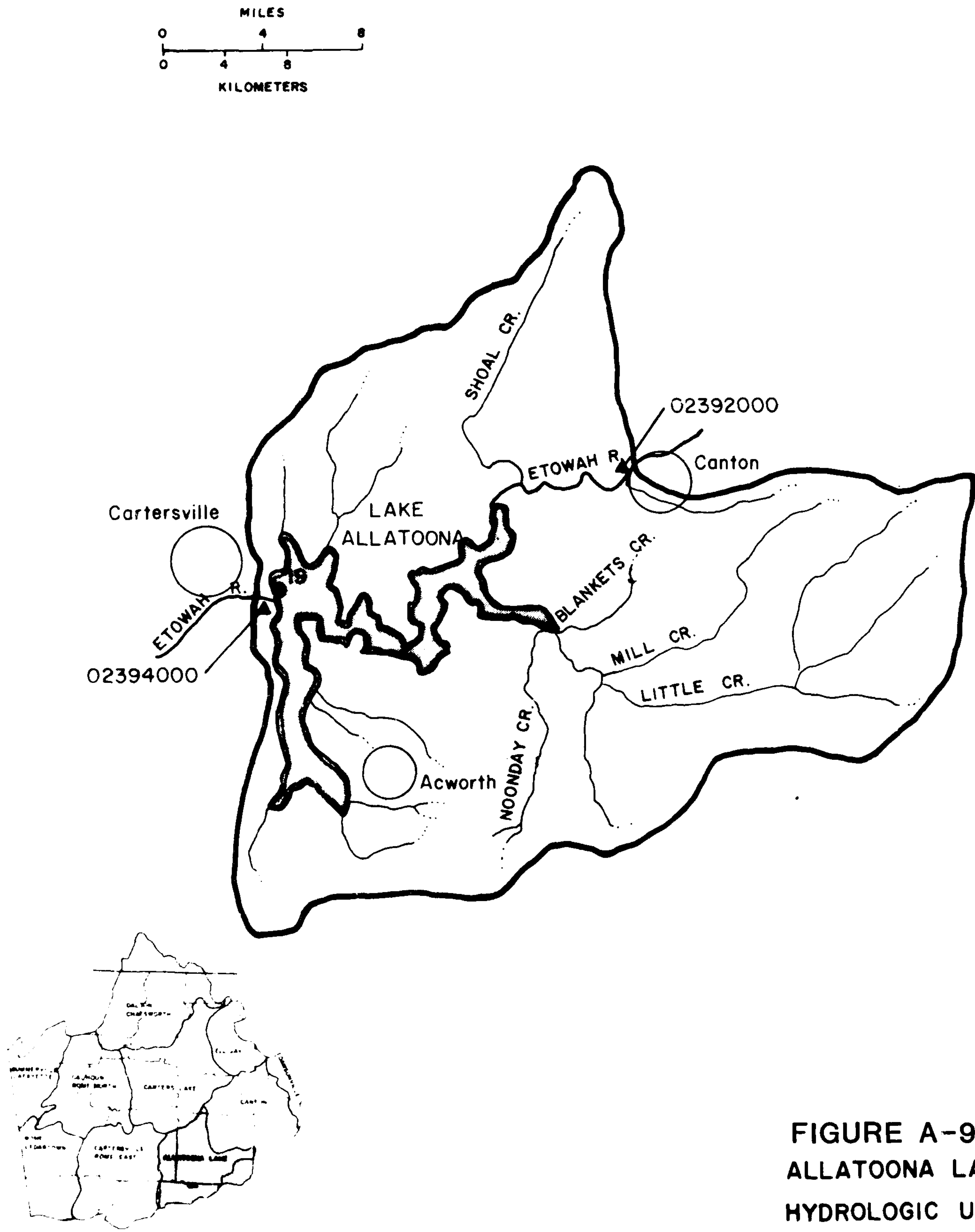


FIGURE A-9
ALLATOONA LAKE 7
HYDROLOGIC UNIT

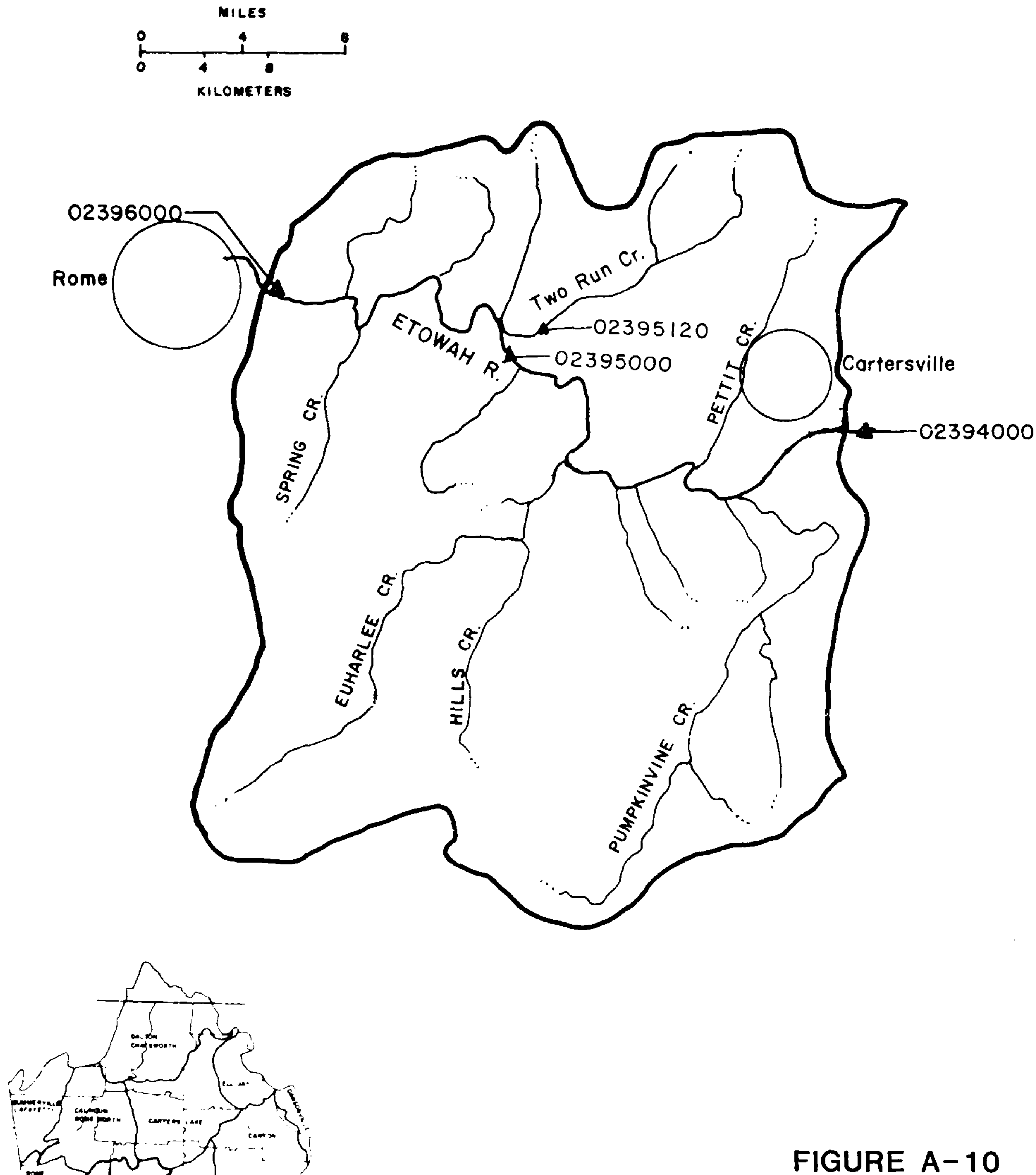
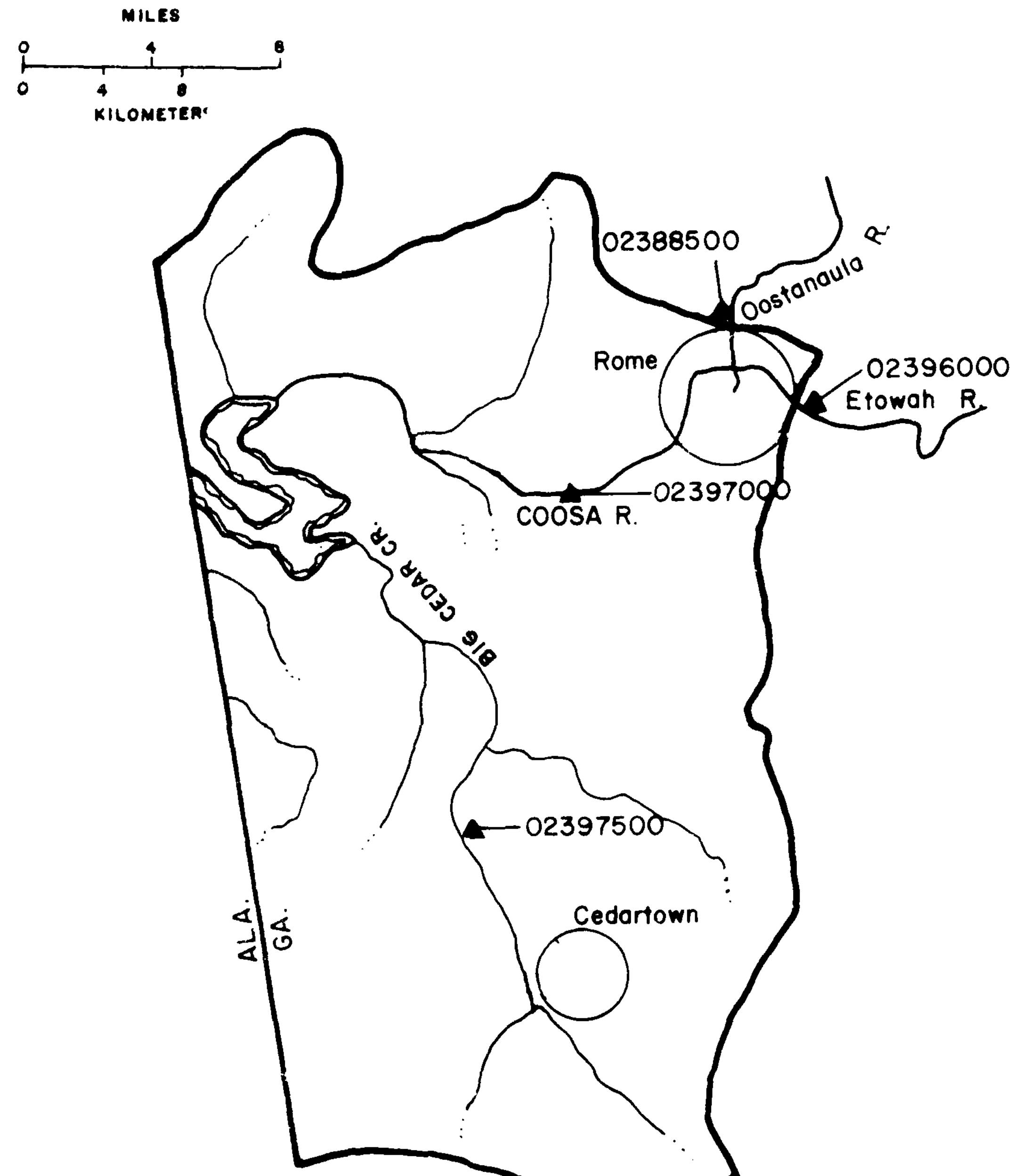


FIGURE A-10
CARTERSVILLE-ROME EAST 8
HYDROLOGIC UNIT



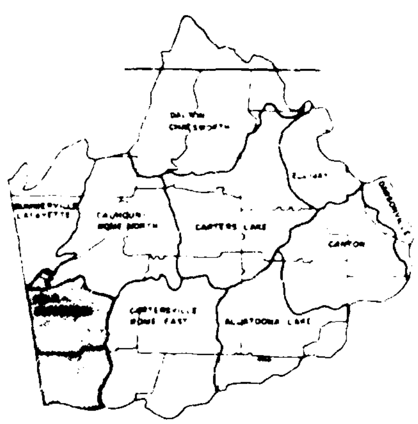
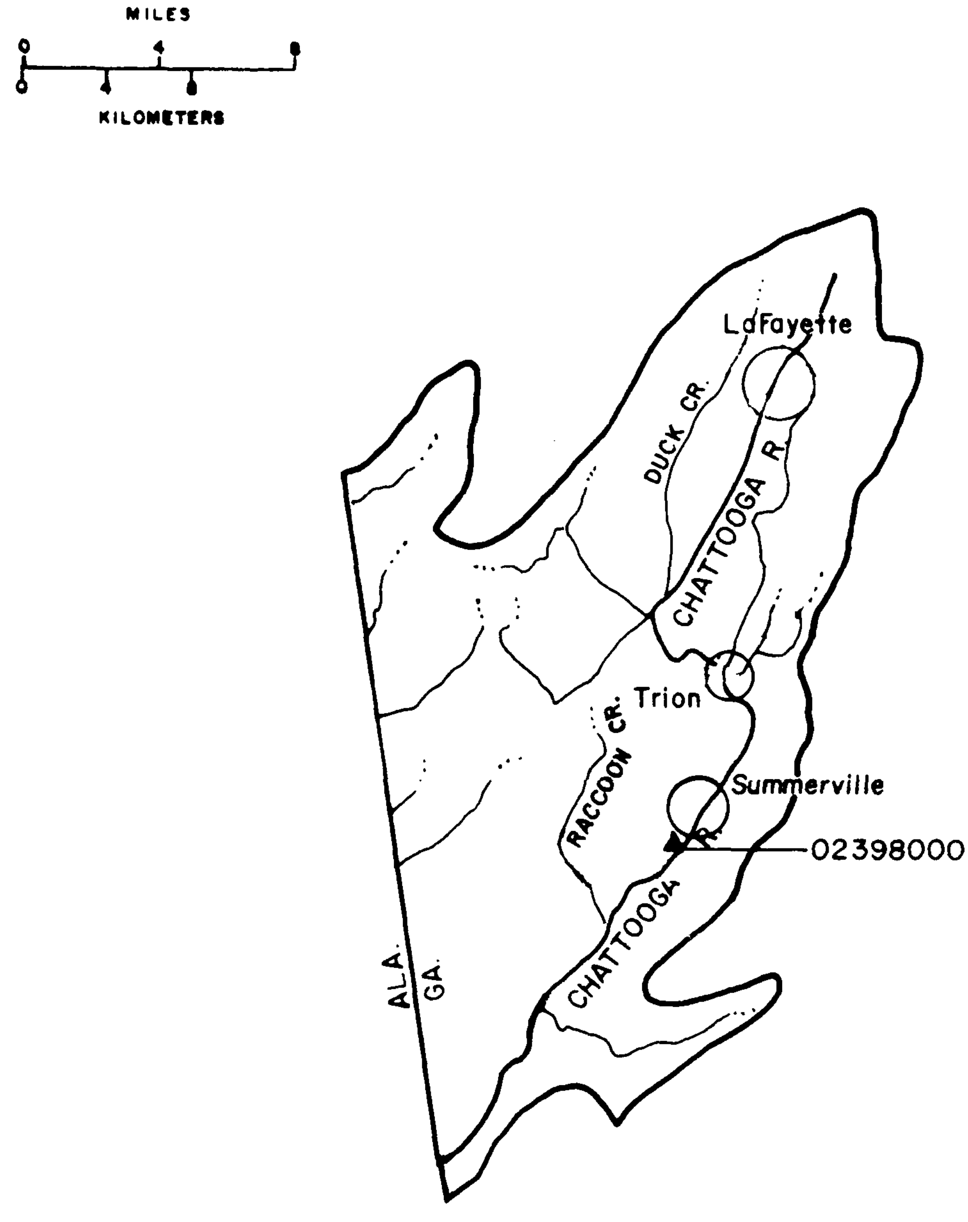


FIGURE A-11

ROME-CEDARTOWN 9

HYDROLOGIC UNIT



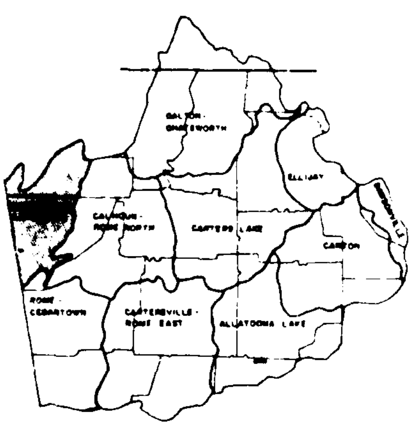


FIGURE A-12

SUMMERVILLE-LAFAYETTE 10

HYDROLOGIC UNIT

APPENDIX B

MICROCOMPUTER SOFTWARE

DEVELOPMENT AND APPLICATION

APPENDIX B

MICROCOMPUTER SOFTWARE DEVELOPMENT AND APPLICATION

Disk Operating System

The disk operating system (MSDOS) manages data and software files used for analysis. Some of the principal operations include: storing files in designated directories, copying files, deleting files, running files, renaming files and serving as the overall management system. Organizing and moving files is an essential element of effective analysis of engineering data.

Project Data

Data used in the Coosa study was placed on microcomputer files in three ways: direct from the keyboard, through transfer (down load) from a minicomputer, and through transmittal via dial-up telephone lines. Some data, the lesser amount by volume, was entered from available reports and other sources directly through the keyboard. A summary of USGS stream gages in the basin is an example. Water use data was available from the USGS database in Doraville, Georgia however it was not compatible with the microcomputer. The USGS made a tape of the desired data which could be read by the Harris 1000 minicomputer at the Hydrologic Engineering Center (HEC) which in turn could communicate to the personal computer. This transfer and down loading process brought the water use data directly to the PC disk operating system where files and directories were developed. The third source of data was the USGS WATSTORE database in Reston, Virginia. This database contains water supply data at stream gage locations throughout the United States. There is also water quality and groundwater data available. To retrieve water supply data for the stream gages in the Coosa Basin a software program CROSSTALK was used together with the necessary hardware accessories. The data retrieved, daily flow statistics and mean monthly flows, were brought directly to the microcomputer where files were established. Bringing project data into the microcomputer with a minimum amount of effort is an important capability which facilitates the engineering analyses needed in the study. Once in the disk operating system the project data was edited and sent to software programs for database management, calculations, graphics and a variety of other analyses.

Database Management

Two large sets of data were used in the study. One for water supply the other for water use. Because the water supply data were summary statistics and monthly means they were transferred directly to a software program for additional calculations and graphical presentation. Water use data, because of the amount and wide variety of information, required sorting and selection prior to analysis. This is an important function of database management software. A commercially available database management program, R:Base 5000, was selected for use with the water use data. Subsequent use of the program demonstrated its great potential and ease of use. Its principal task was to sort through the large water use database, select data which was useful for analysis, print needed summaries, and transfer selected data to another software program for calculation of statistics and graphics. The water use database is available on diskettes for use in future studies in the Basin.

Calculations, Graphics and Statistics

A commercially available software program, LOTUS 1-2-3, was used for calculations, graphics, statistics and as a template for data input to a reservoir simulation program. The program was used: to compute the standard deviation of water use data and to plot that data; to simulate releases from Carters Reservoir; to do regression analysis of simulated and actual release data; to analyze and plot water supply data at stream gages; and as a template for input data for a reservoir simulation program. All graphs in the report (except basin maps) were developed with LOTUS 1-2-3 and an HP7475A Plotter. USGS water use and supply data files were transferred into LOTUS using LOTUS file capability.

Water Balance

A special menu driven spreadsheet was developed using LOTUS 1-2-3 to speed the development of water supply and use balances for the basin. A balance can be developed for a user, a river reach, or sub-basin or basin. The basic use of supply data is developed and the water balance presents the results in a summary form.

Single Reservoir Simulation

HEC computer program "Reservoir Yield" was converted to run on the microcomputer and was used in this study to simulate the operation of Carters Reservoir. This program simulates the operation of a single reservoir for multiple purposes: water supply, hydroelectric power, and water quality. A template for preparing input data was developed using LOTUS 1-2-3 and the resulting file transferred to the simulation program for execution. The results were compared with the reservoir simulation run directly using LOTUS as a spreadsheet calculator.

Frequency Analysis

The USGS WATSTORE database contains frequency analyses of streamflow data at all gage locations. A Log Pearson Type III distribution is available (if desired) for low-flow frequency analysis and percent time exceeded values are available for flow-duration analysis. Where such data is not available at a gage site, or where it is desired to do a separate analysis, HEC computer program "STATS" is available for use on the microcomputer. In addition to the normal frequency analyses, the STATS program does expected probability adjustment for flood flows.

Stochastic Analysis

HEC computer program "Monthly Streamflow Simulation" was used to develop synthetic streamflow sequences for the Coosawattee River at Carters. At present this program is not available for use on a microcomputer. It is hoped that in the near future this program or a comparable stochastic streamflow analysis program will be operable on a microcomputer to round out the analysis capability which already exists.

Other Software

Three other computer programs were obtained for use on the study, but for various reasons were not used.

Groundwater Simulation. The USGS groundwater simulation programs, in either 2 or 3-dimensions, are available for use on the microcomputer. These programs simulate the flow of groundwater in unconfined and confined aquifers and are frequently used to determine water table levels or piezometric heads where the aquifer is being heavily pumped. In the Coosa Basin groundwater is not presently a major source of supply.

Optimization. Finding the minimum cost for water supply, water treatment, or site locations is a common need in water supply analysis. VINO/PC is a commercially available microcomputer software program which does linear programming optimization for minimum and maximum type analyses. Input to the program uses LOTUS 1-2-3 as a template. The program was not used in this study because it was not a purpose of the study to analyze cost. It may be an appropriate next step once alternative supplies and costs are defined.

Forecasting. Forecasting of future water needs was not included as a purpose of this investigation, however, an HEC computer program "A Model for Estimating Water Demand" is available for such use. This program can be used for making water use forecasts - municipal, industrial, agricultural. In the Coosa Basin, during the past five years, there has been no growth in water use which cannot be forecast by simply using trend extrapolation. Should a more in-depth analysis be desired the DEMAND model would be appropriate.

Hardware

IBM PC-XT, 512 Bytes RAM, 10 MB Internal Hard Disk

IBM Color Monitor

Okidata 84 Step 2 Printer

HP 7475A Plotter

DSDD, 360K Bytes Diskettes

Hayes Smartmodem 1200 B

Commercial Software

MSDOS (Release 2.1) Microsoft Corp.

CROSSTALK XVI (Release 3.5) Microstuf, Inc.

R:BASE 5000 (Release 1.01) Microrim

LOTUS 1-2-3 (Release 2.0) LOTUS Development Corporation

APPENDIX C

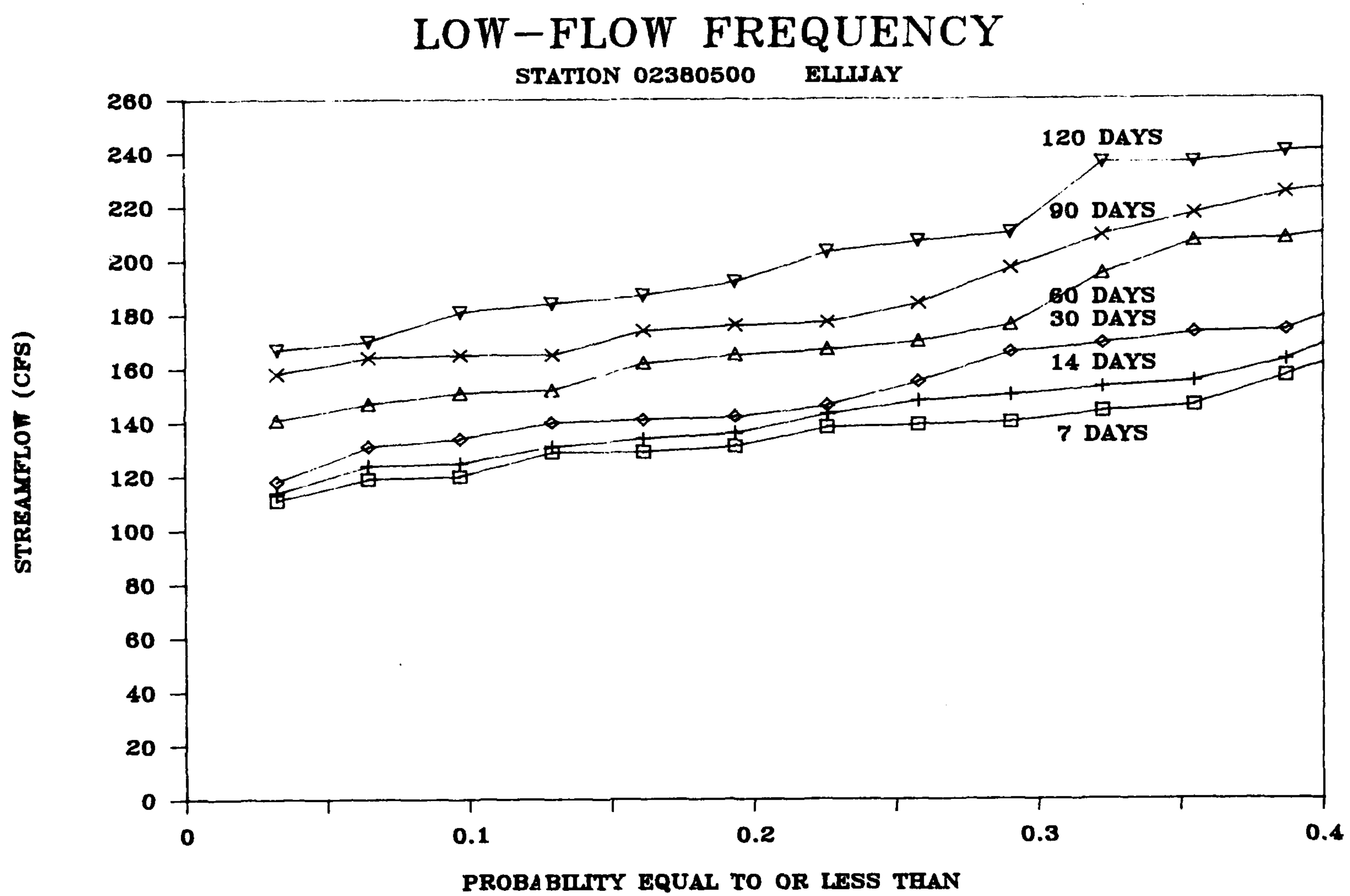
LOW-FLOW FREQUENCY CURVES

APPENDIX C

LOW-FLOW FREQUENCY CURVES

Contents

Note: Three stations with short records are not included: Station 02384500, Eton; Station 02388320, Armuchee; Station 02395120, Kingston.



LOW-FLOW FREQUENCY
STATION 02380500 ELLIJAY
120 DAYS
90 DAYS
60 DAYS
30 DAYS
14 DAYS
7 DAYS
STREAMFLOW (CFS)
PROBABILITY EQUAL TO OR LESS THAN
0
20
40
60
80
100
120
140
160
180
200
220
240
260
0
0.1
0.2
0.3
0.4

FIGURE C-1

LOW-FLOW FREQUENCY

STATION 02381600 TALKING ROCK

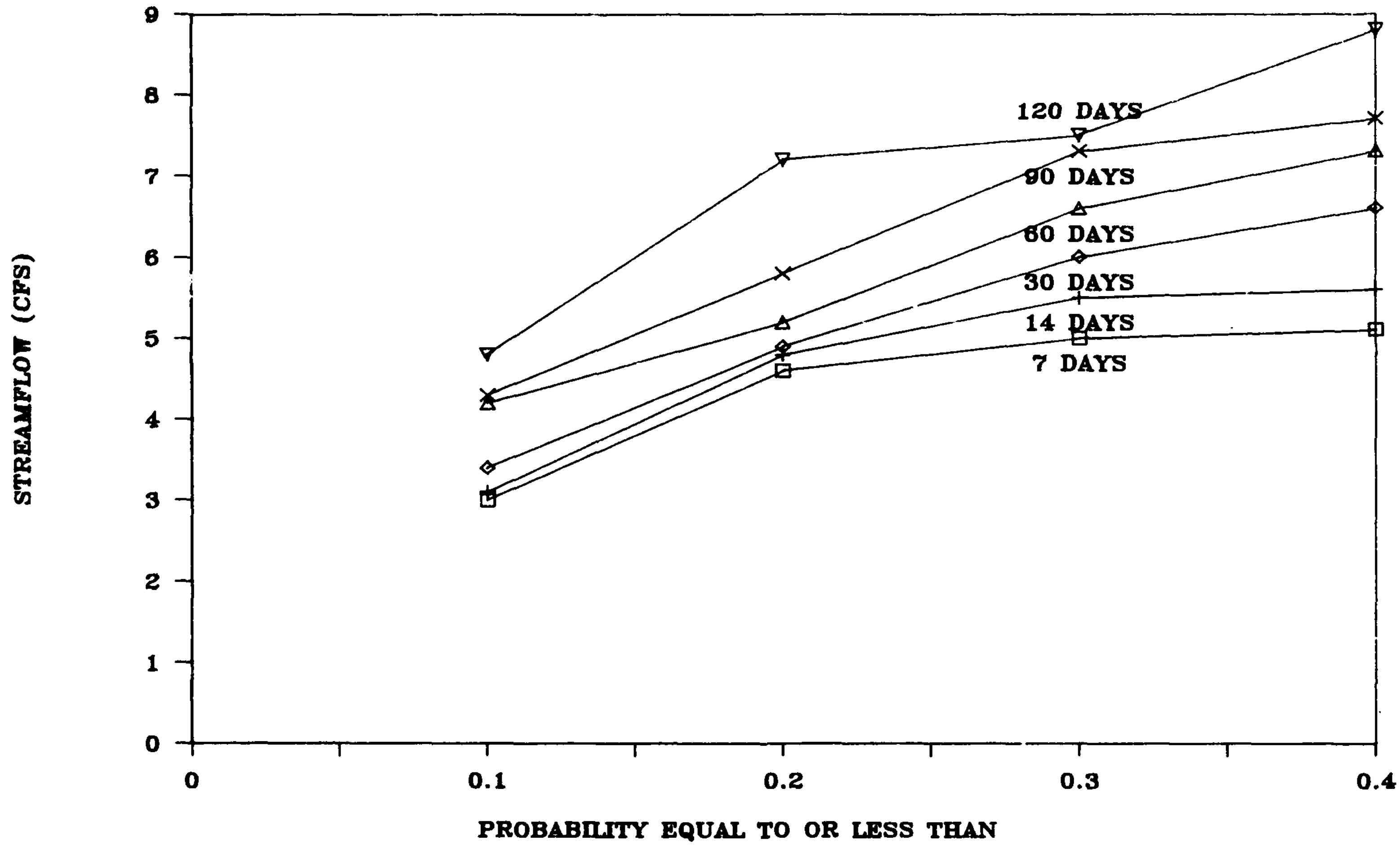


FIGURE C-2

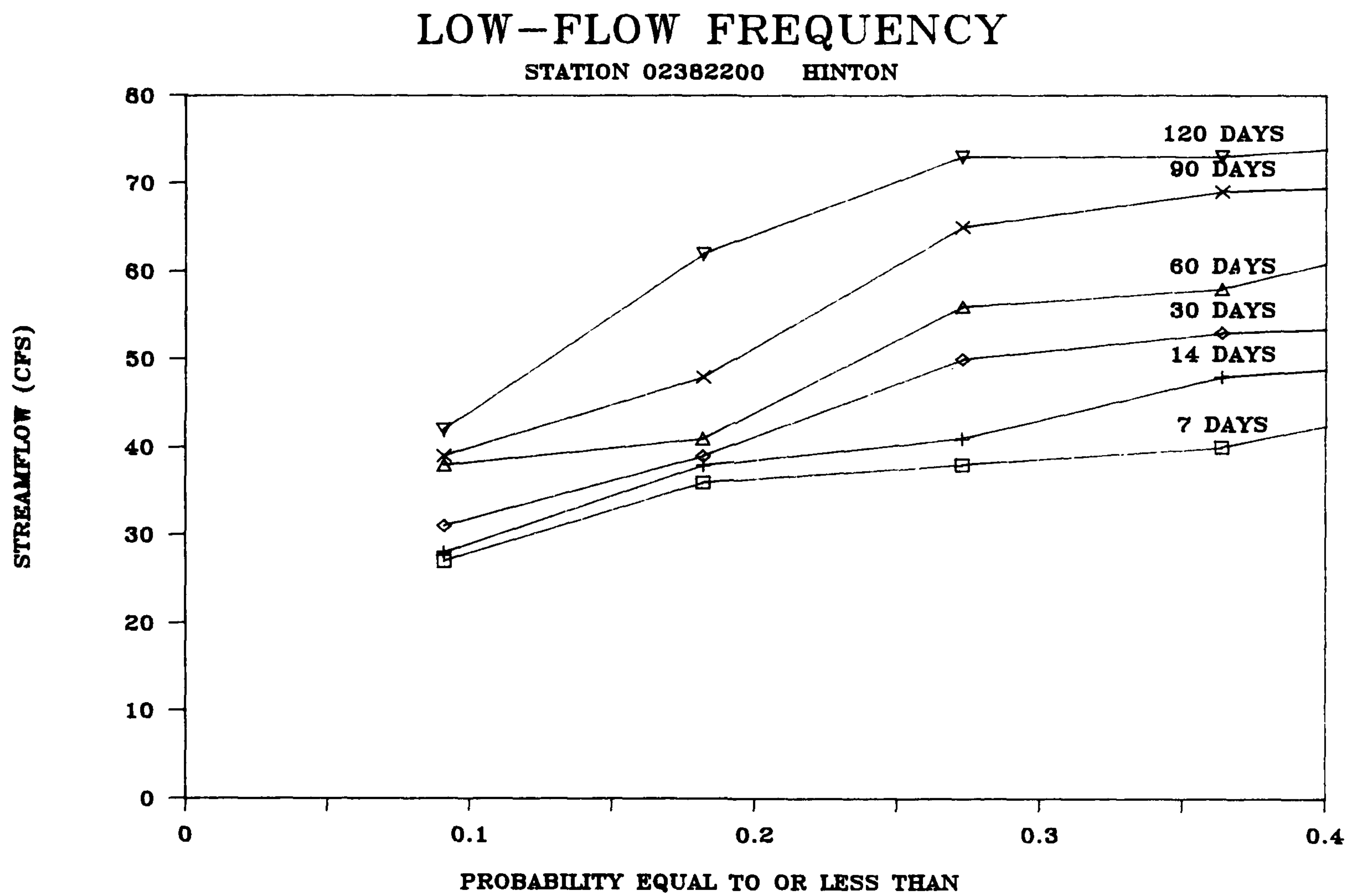

LOW-FLOW FREQUENCY
STATION 02382200 HINTON
STREAMFLOW (CFS)
80
70
60
50
40
30
20
10
0
0
0.1
0.2
0.3
0.4
PROBABILITY EQUAL TO OR LESS THAN
120 DAYS
90 DAYS
60 DAYS
30 DAYS
14 DAYS
7 DAYS

FIGURE C-3

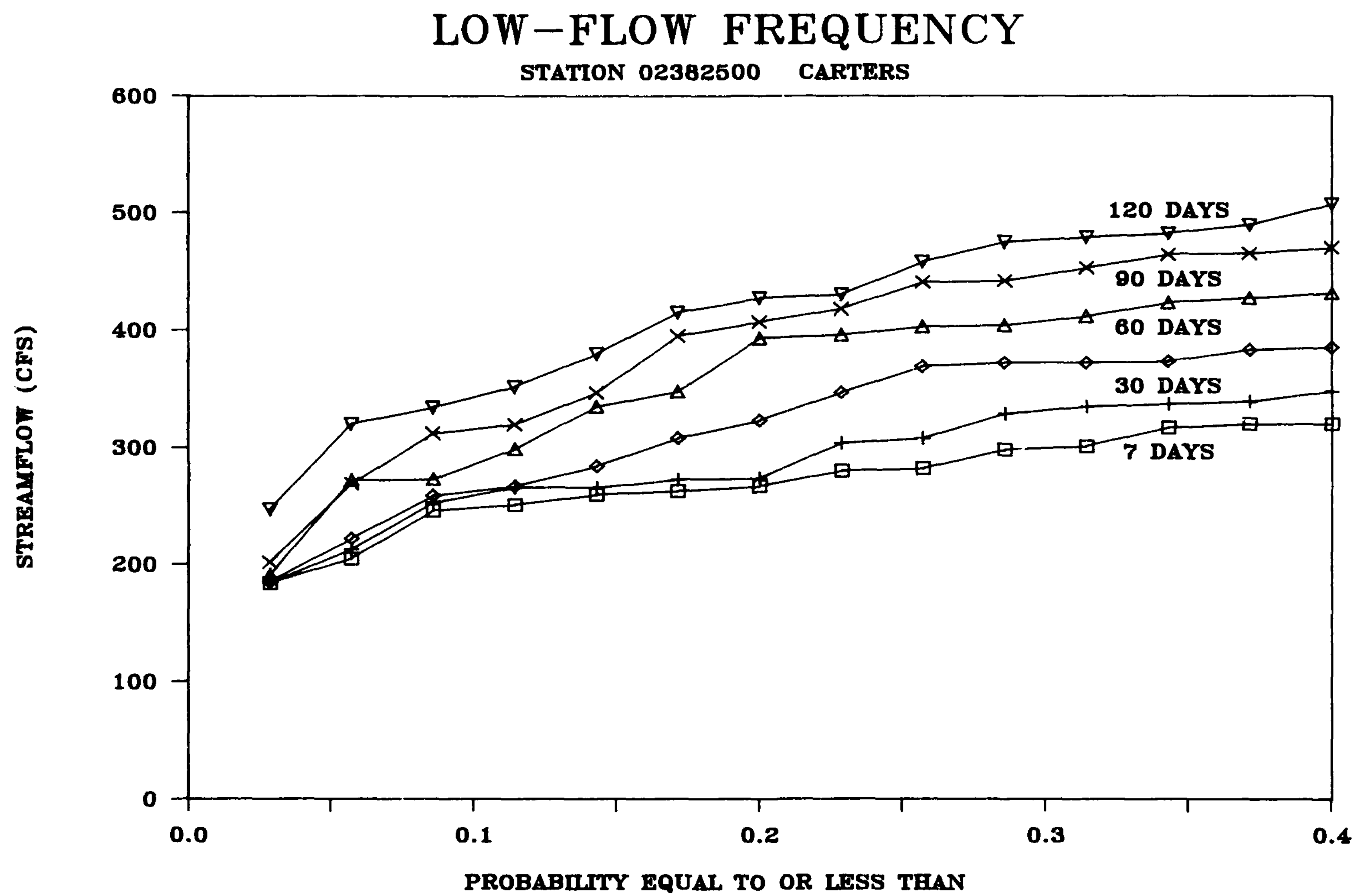

LOW-FLOW FREQUENCY
STATION 02382500 CARTERS
STREAMFLOW (CFS)
0
100
200
300
400
500
600
0.0
0.1
0.2
0.3
0.4
PROBABILITY EQUAL TO OR LESS THAN
120 DAYS
90 DAYS
60 DAYS
30 DAYS
7 DAYS

FIGURE C-4

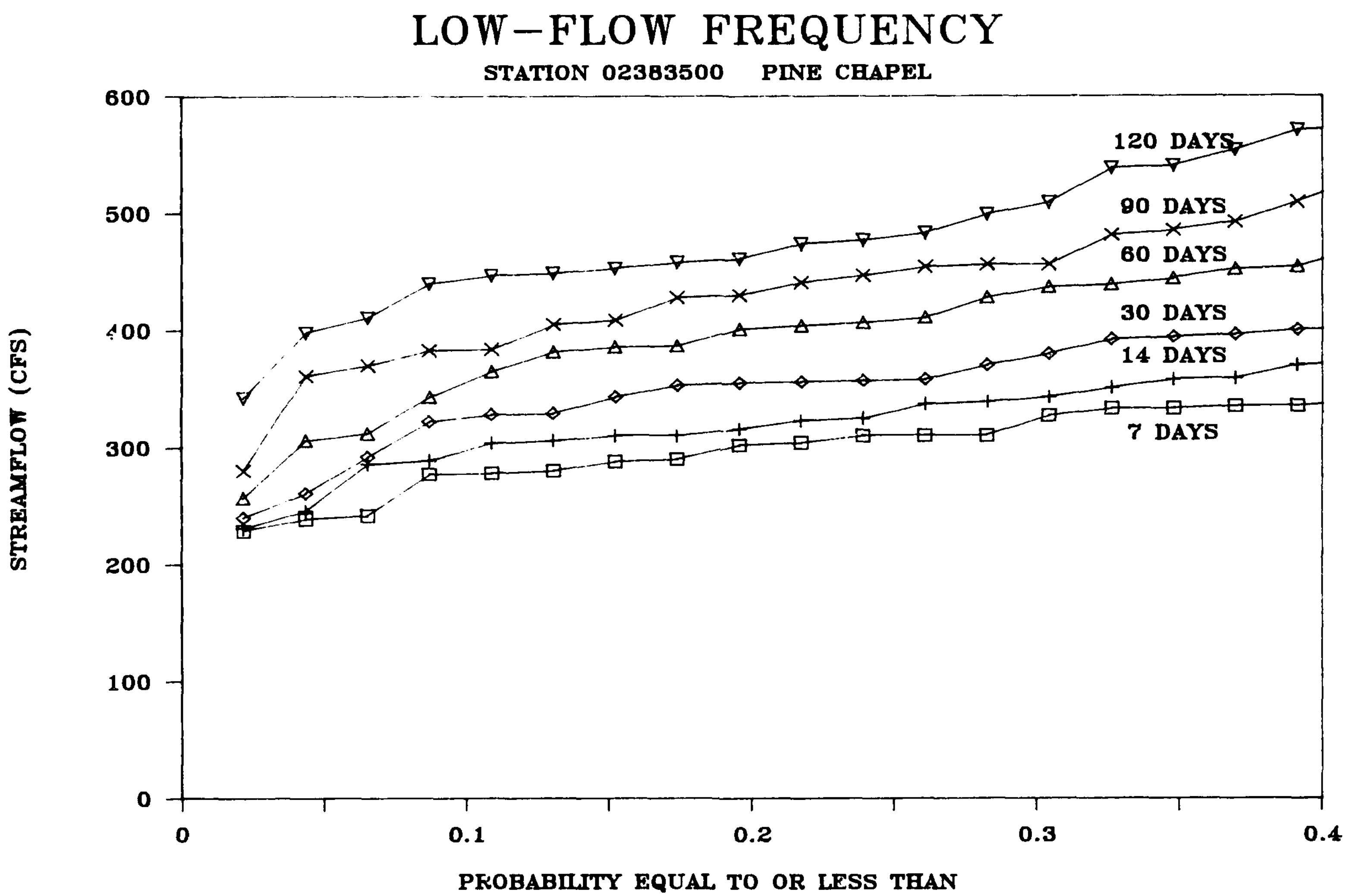

LOW-FLOW FREQUENCY
STATION 02383500 PINE CHAPEL
STREAMFLOW (CFS)
PROBABILITY EQUAL TO OR LESS THAN
120 DAYS
90 DAYS
60 DAYS
30 DAYS
14 DAYS
7 DAYS
0
100
200
300
400
500
600
0
0.1
0.2
0.3
0.4

FIGURE C-5

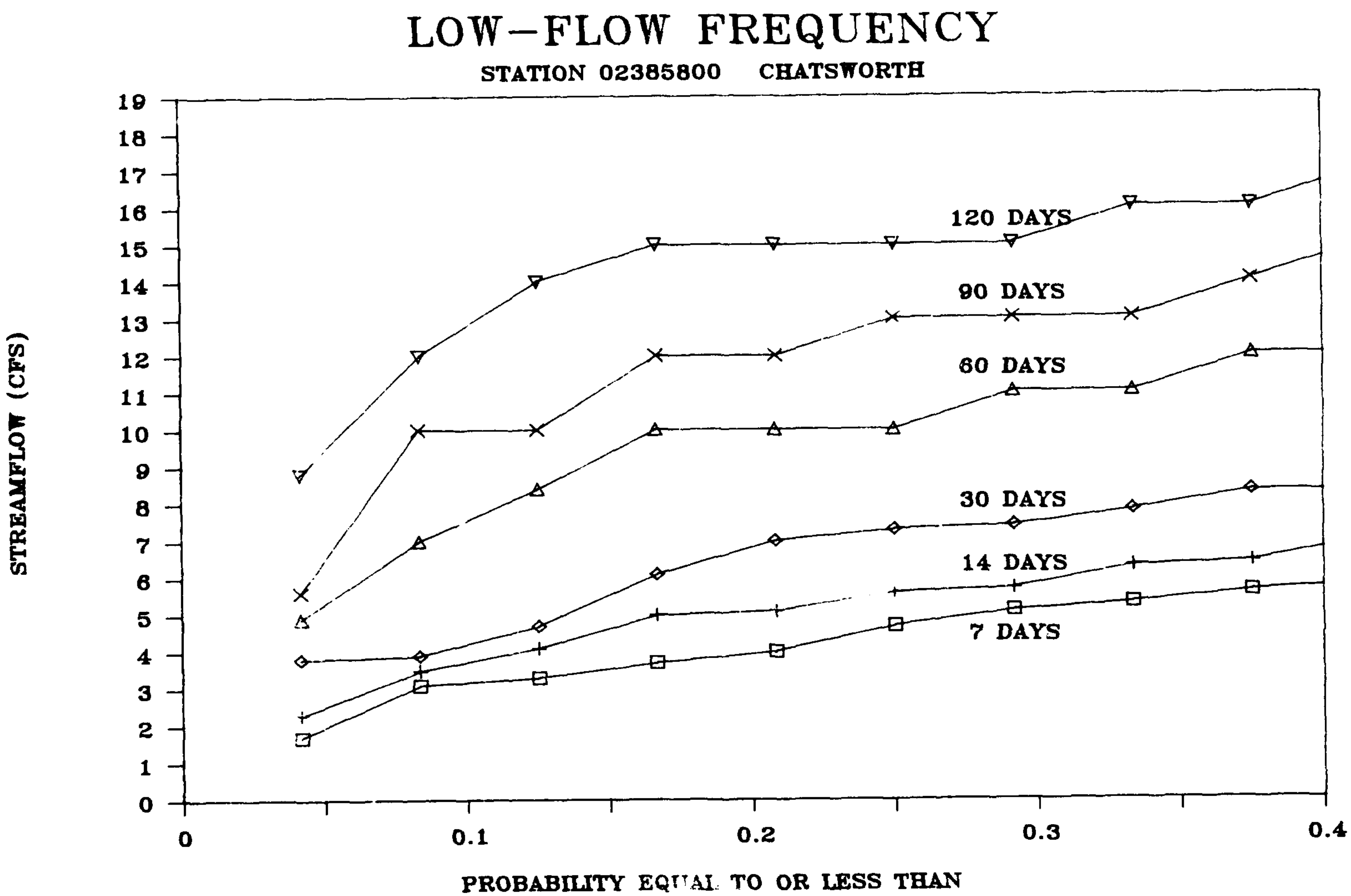

LOW–FLOW FREQUENCY
STATION 02385800 CHATSWORTH
STREAMFLOW (CFS)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
0
0.1
0.2
0.3
0.4
PROBABILITY EQUAL TO OR LESS THAN
120 DAYS
90 DAYS
60 DAYS
30 DAYS
14 DAYS
7 DAYS

FIGURE C–6

LOW-FLOW FREQUENCY

STATION 02387000 TILTON

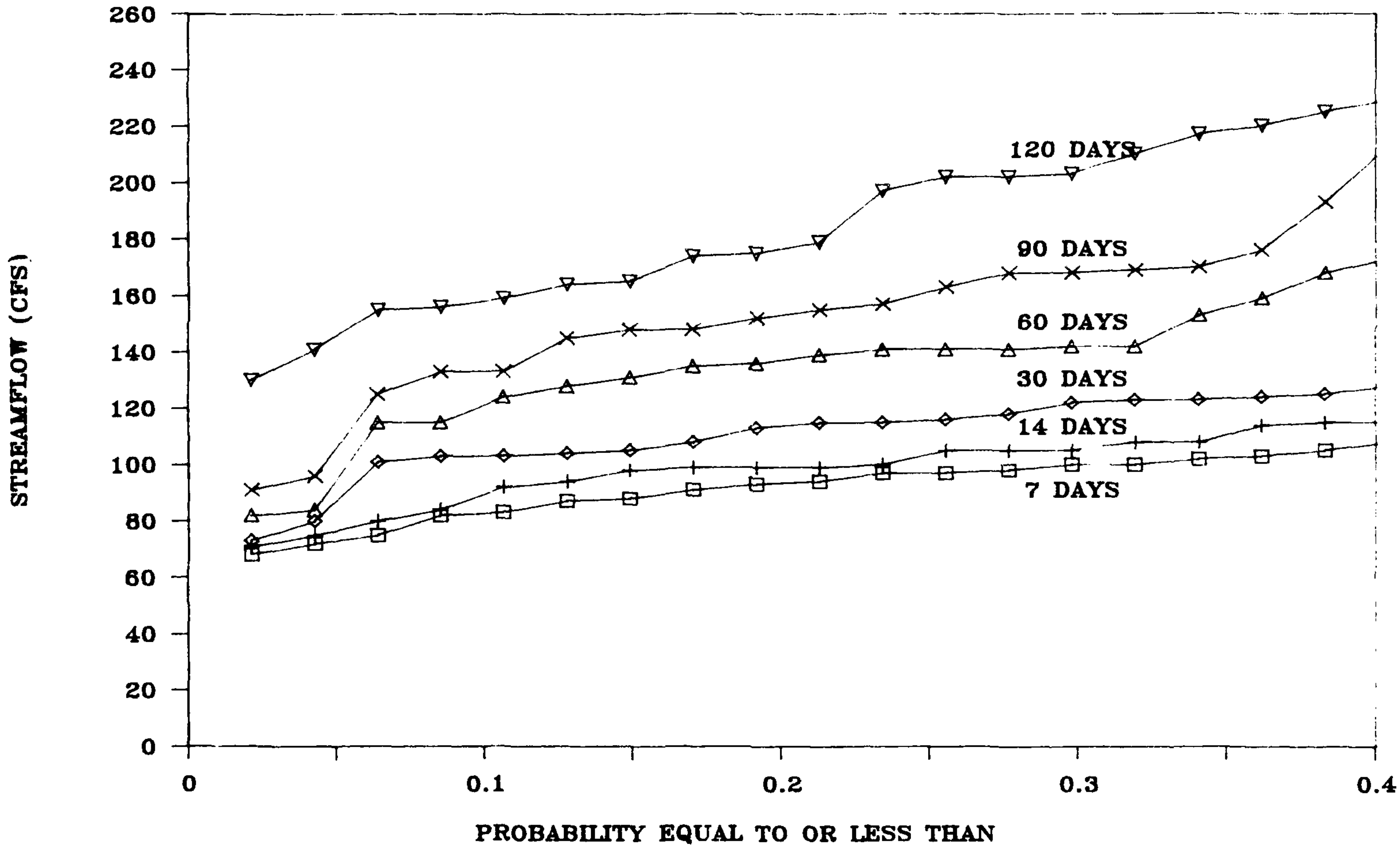


FIGURE C-7

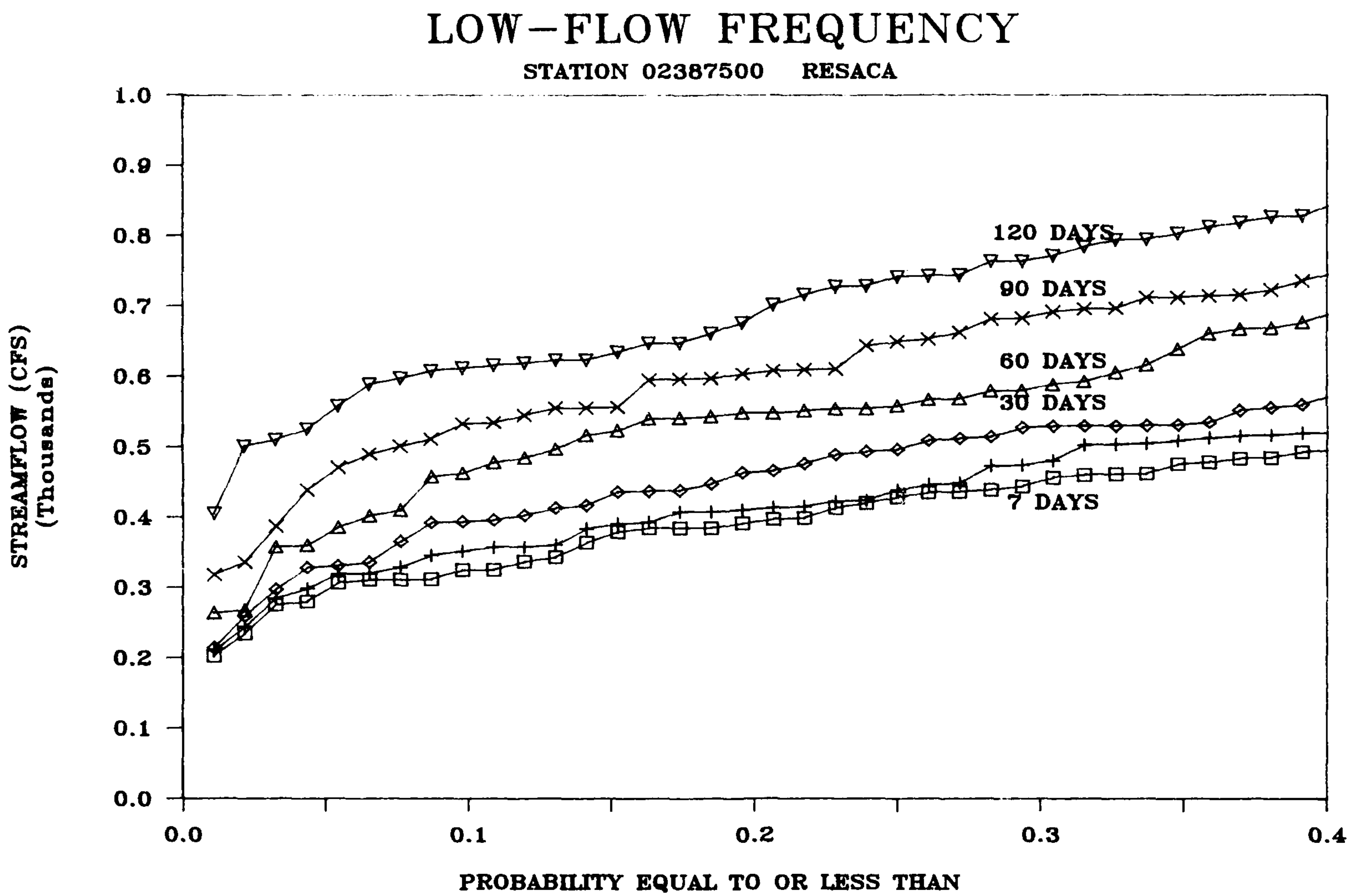

LOW-FLOW FREQUENCY
STATION 02387500 RESACA
STREAMFLOW (CFS)
(Thousands)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
120 DAYS
90 DAYS
60 DAYS
30 DAYS
7 DAYS
0.0
0.1
0.2
0.3
0.4
PROBABILITY EQUAL TO OR LESS THAN

FIGURE C-8

LOW–FLOW FREQUENCY

STATION 02388300 ROME

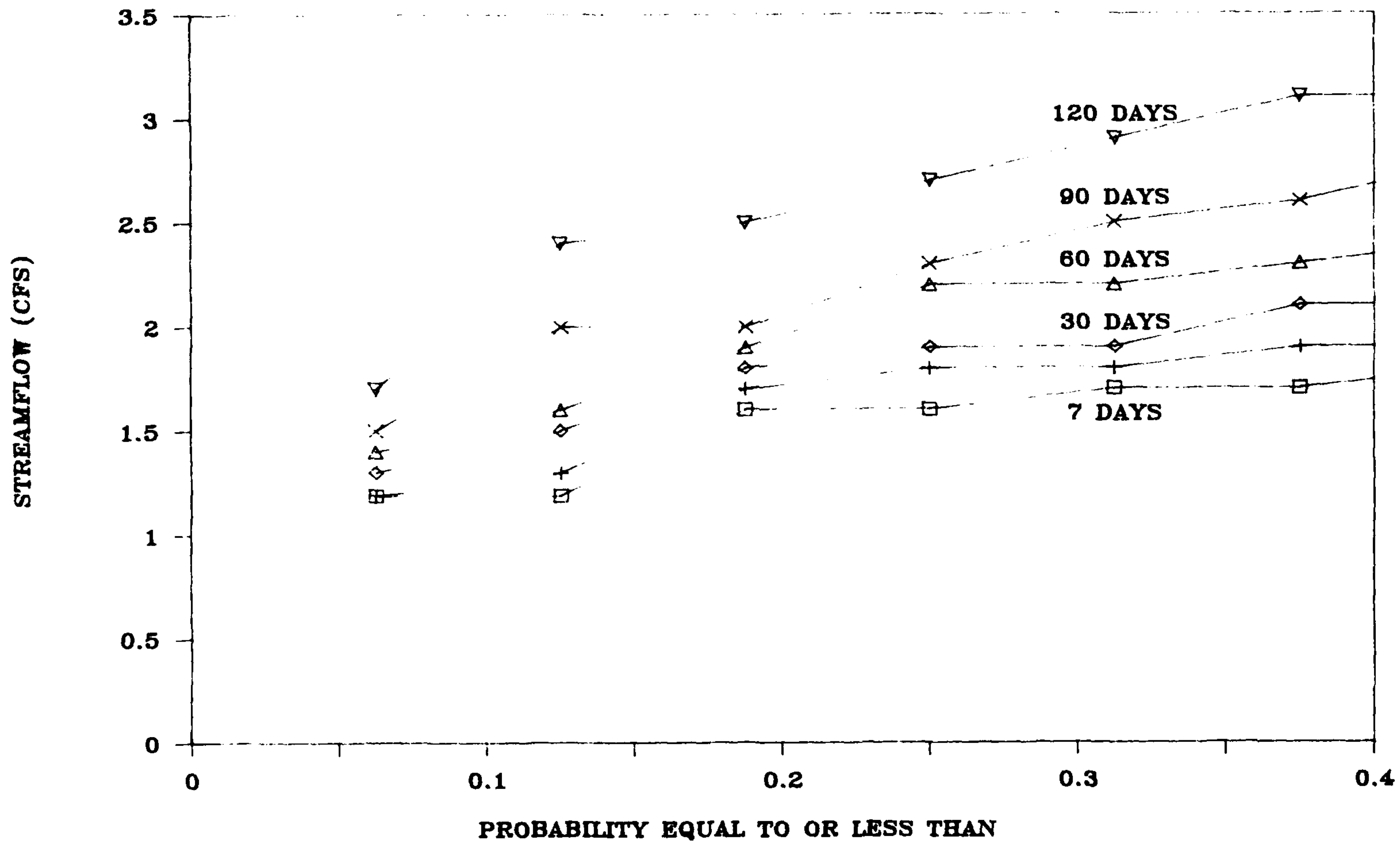
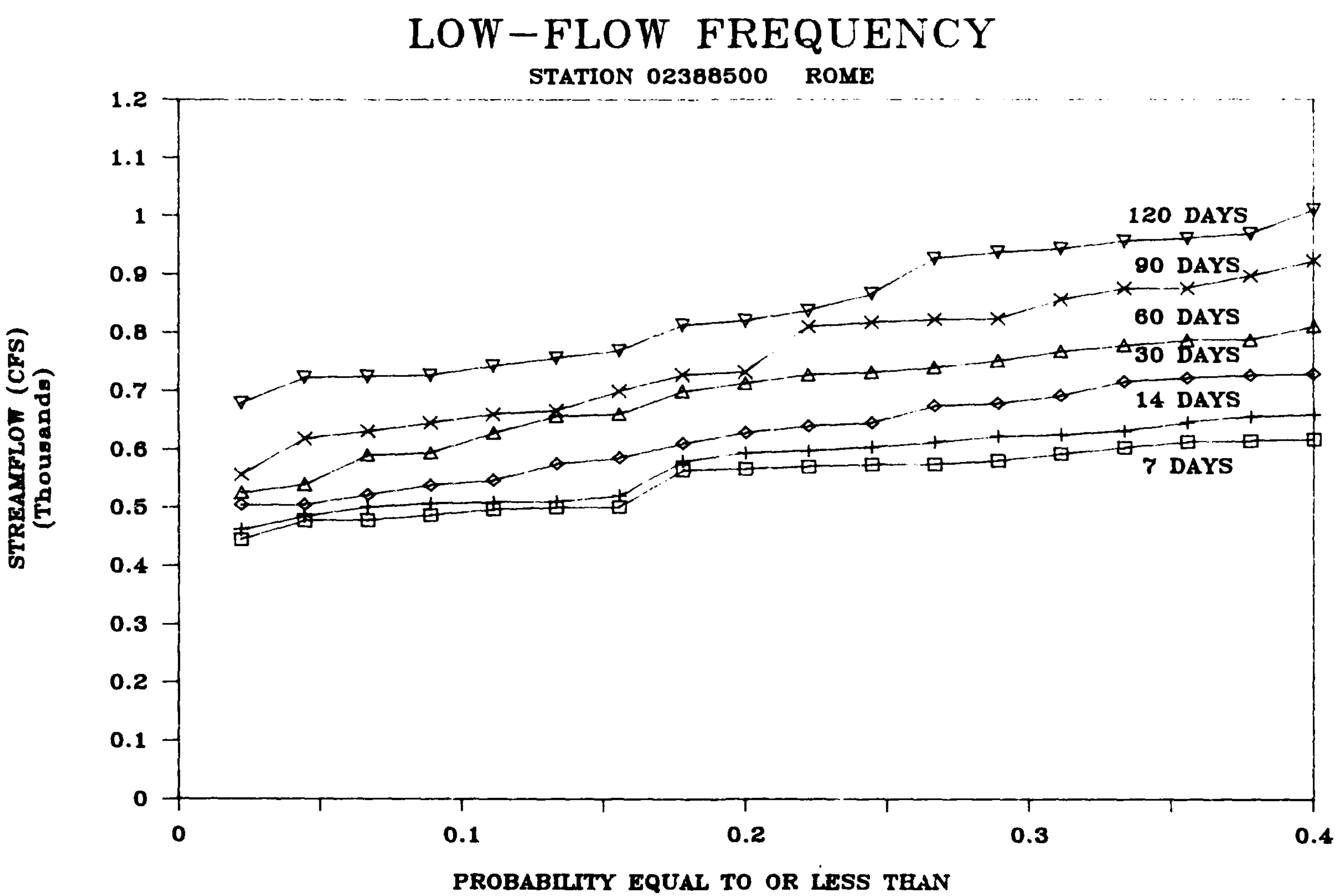
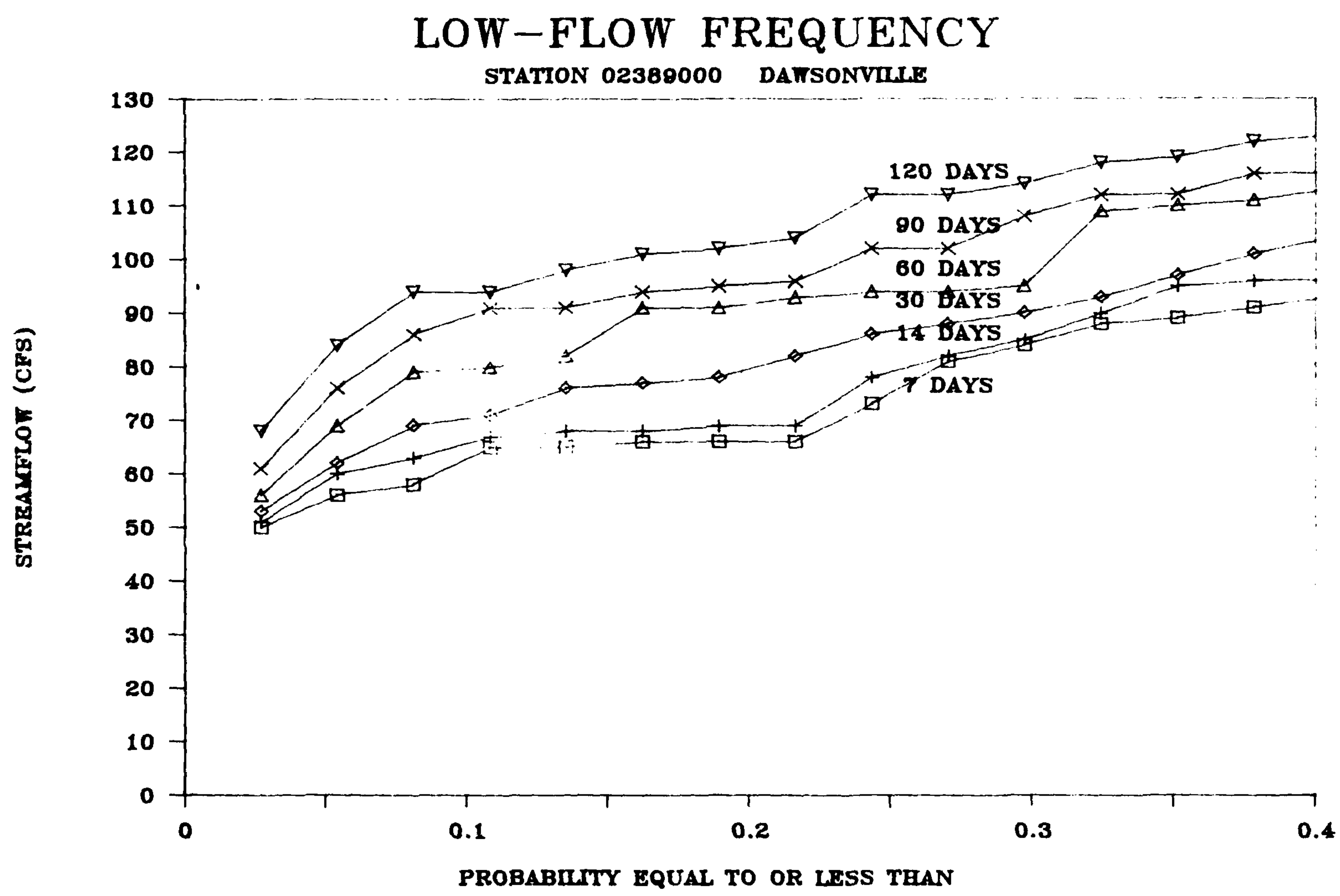


FIGURE C–9



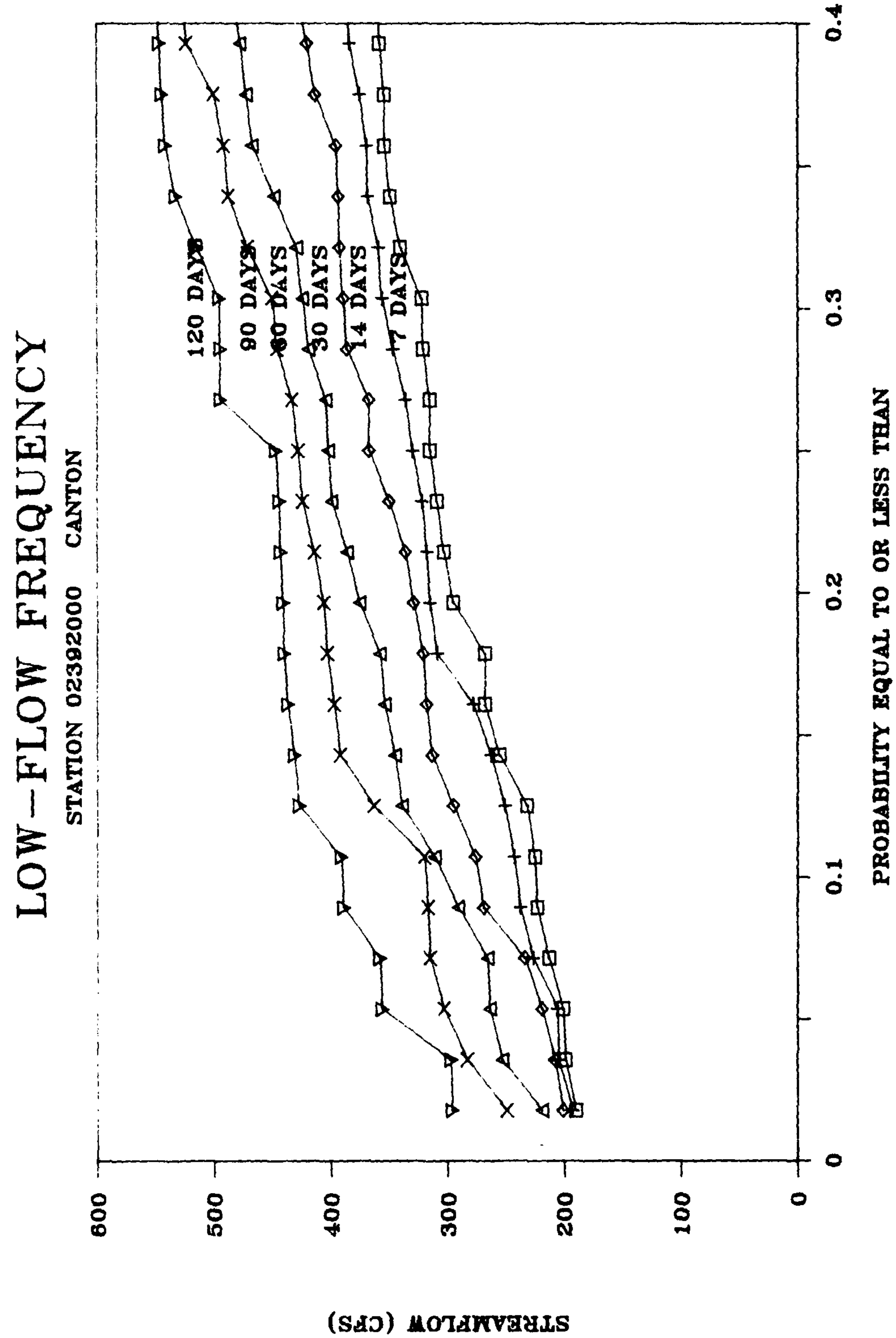
LOW-FLOW FREQUENCY
STATION 02388500 ROME
STREAMFLOW (CFS)
(Thousands)
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
0.1
0.2
0.3
0.4
PROBABILITY EQUAL TO OR LESS THAN
120 DAYS
90 DAYS
60 DAYS
30 DAYS
14 DAYS
7 DAYS

FIGURE C-10



LOW-FLOW FREQUENCY
STATION 02389000 DAWSONVILLE
STREAMFLOW (CFS)
130
120
110
100
90
80
70
60
50
40
30
20
10
0
0
0.1
0.2
0.3
0.4
PROBABILITY EQUAL TO OR LESS THAN
120 DAYS
90 DAYS
60 DAYS
30 DAYS
14 DAYS
7 DAYS

FIGURE C-11



LOW-FLOW FREQUENCY
STATION 02392000 CANTON
120 DAYS
90 DAYS
60 DAYS
30 DAYS
14 DAYS
7 DAYS
STREAMFLOW (CFS)
PROBABILITY EQUAL TO OR LESS THAN
0
100
200
300
400
500
600
0.1
0.2
0.3
0.4

FIGURE C-12

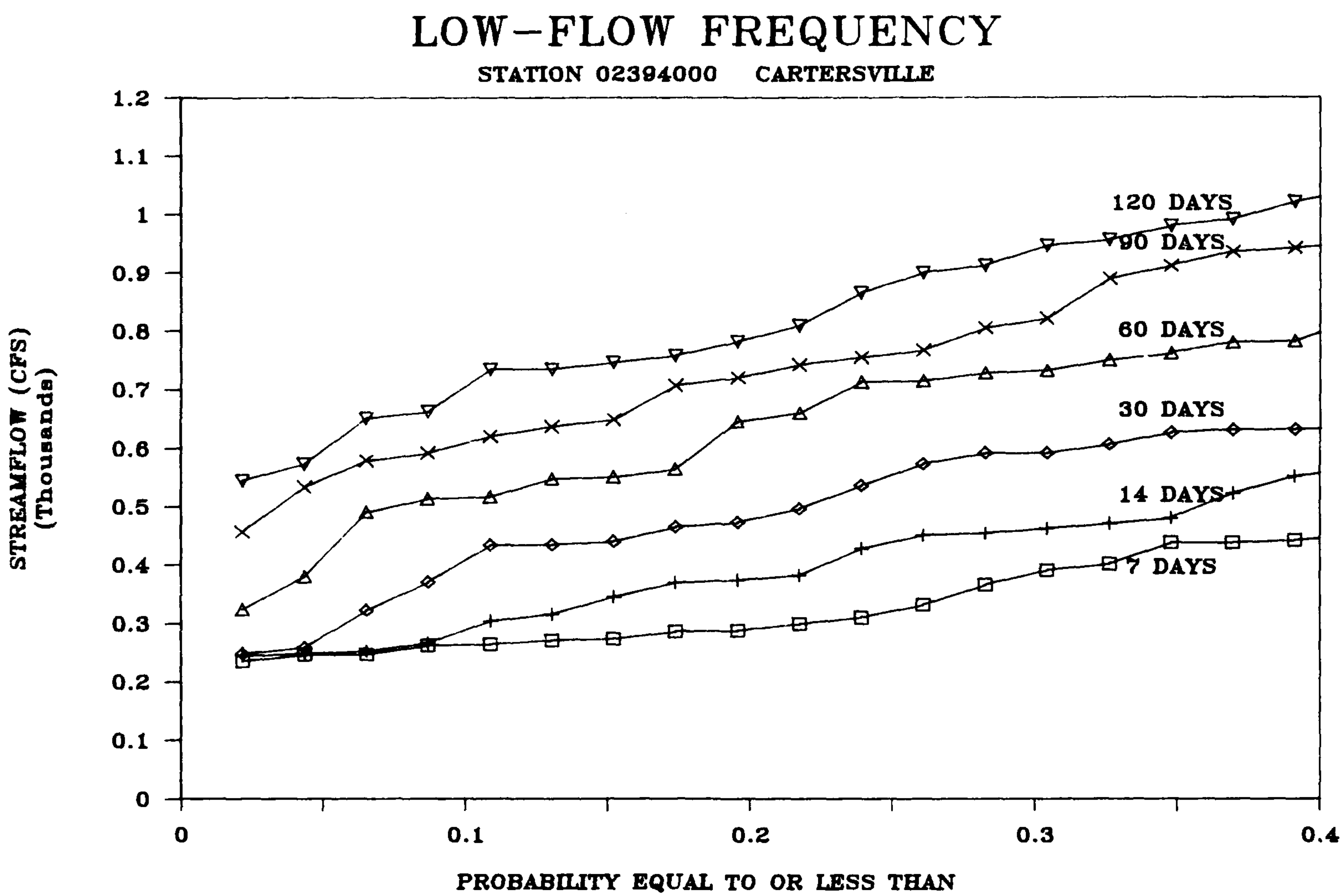

LOW-FLOW FREQUENCY
STATION 02394000 CARTERSVILLE
STREAMFLOW (CFS) (Thousands)
120 DAYS
90 DAYS
60 DAYS
30 DAYS
14 DAYS
7 DAYS
PROBABILITY EQUAL TO OR LESS THAN
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2

FIGURE C-13

LOW–FLOW FREQUENCY

STATION 02395000   KINGSTON

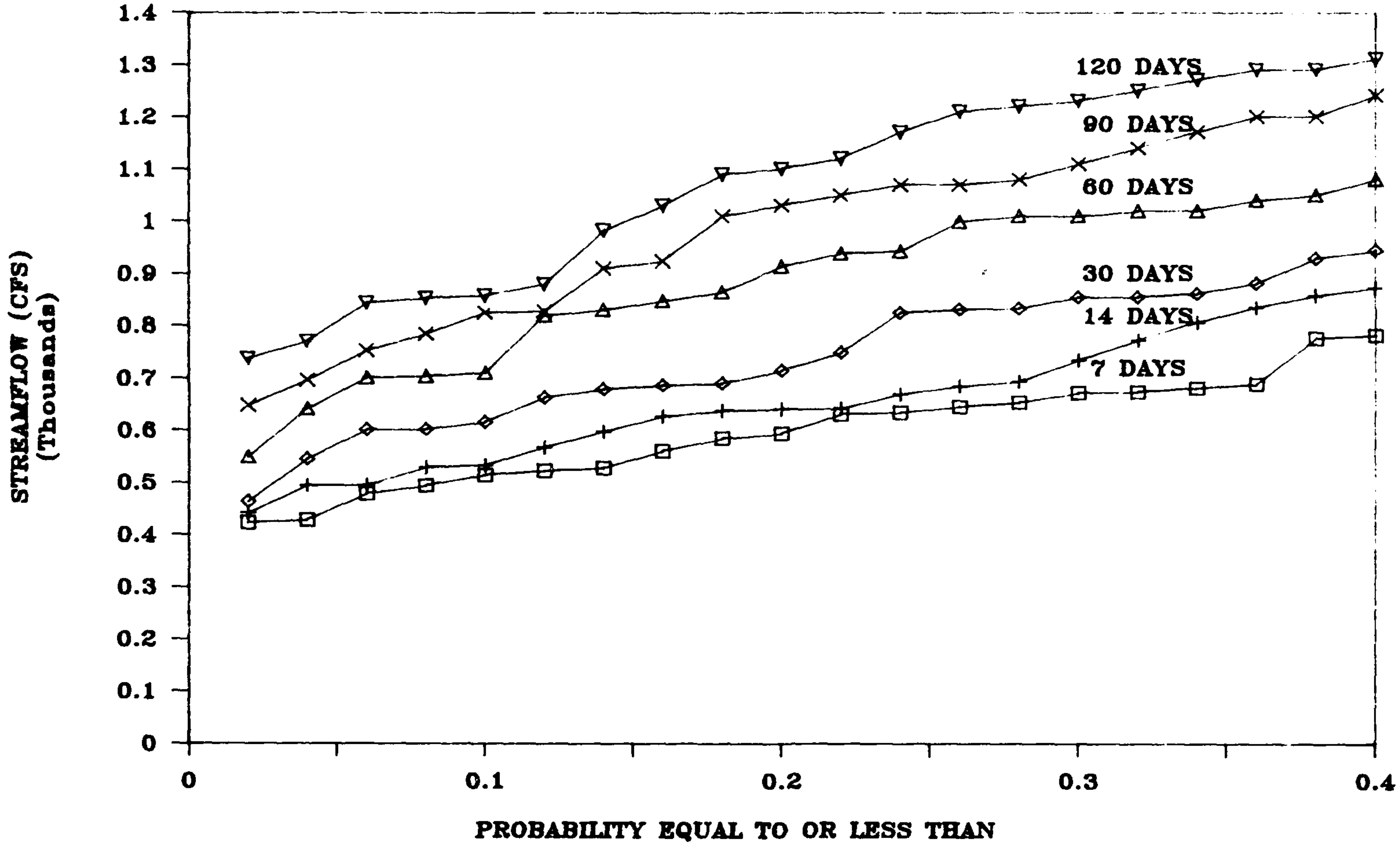
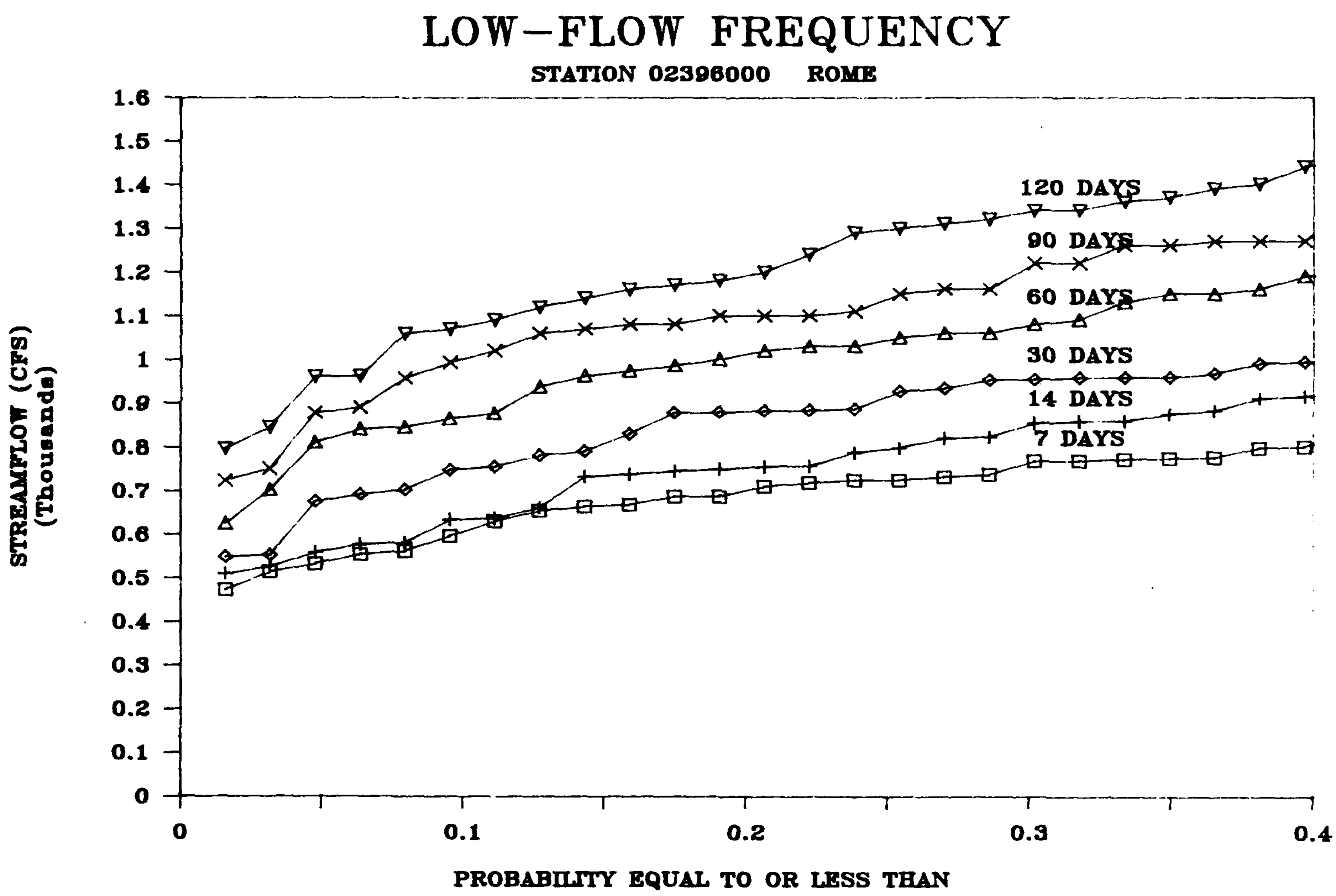


FIGURE C–14



LOW-FLOW FREQUENCY
STATION 02396000 ROME
STREAMFLOW (CFS)
(Thousands)
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
120 DAYS
90 DAYS
60 DAYS
30 DAYS
14 DAYS
7 DAYS
0
0.1
0.2
0.3
0.4
PROBABILITY EQUAL TO OR LESS THAN

FIGURE C-15

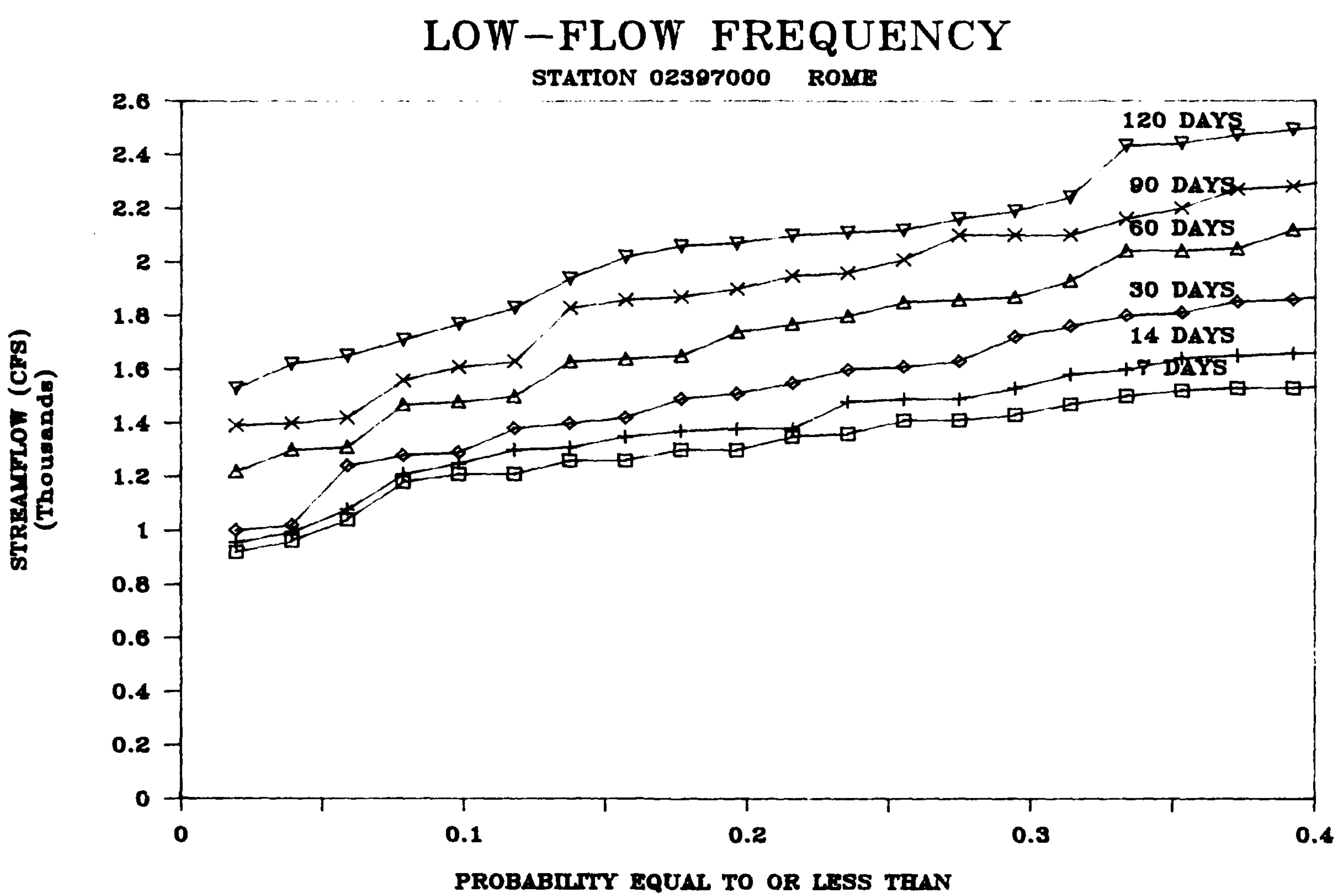

LOW-FLOW FREQUENCY
STATION 02397000 ROME
STREAMFLOW (CFS)
(Thousands)
PROBABILITY EQUAL TO OR LESS THAN
120 DAYS
90 DAYS
60 DAYS
30 DAYS
14 DAYS
7 DAYS
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
2.2
2.4
2.6
0.1
0.2
0.3
0.4

FIGURE C-16

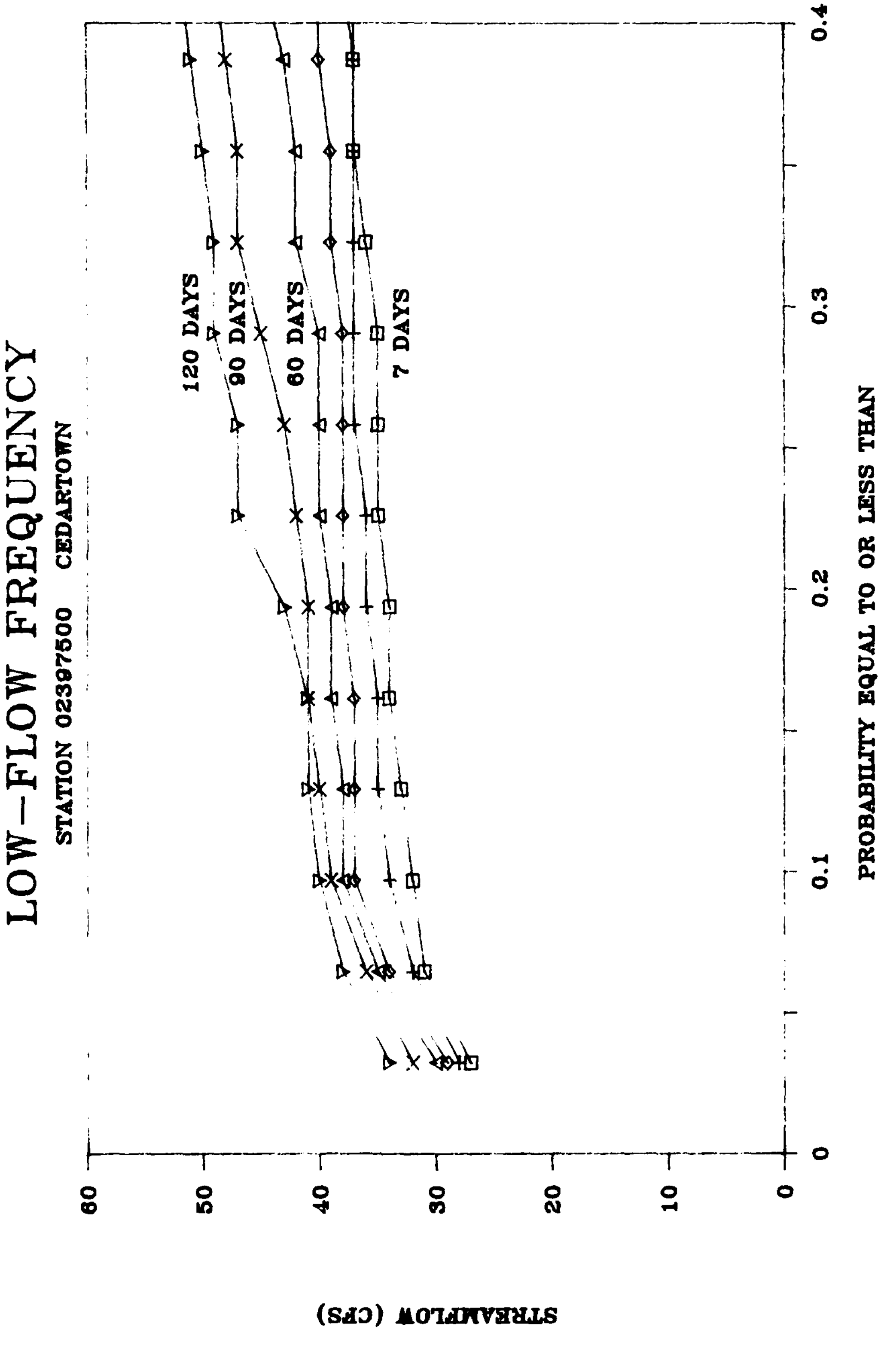

LOW-FLOW FREQUENCY
STATION 02397500 CEDARTOWN
120 DAYS
90 DAYS
60 DAYS
7 DAYS
STREAMFLOW (CFS)
PROBABILITY EQUAL TO OR LESS THAN
0
10
20
30
40
50
60
0
0.1
0.2
0.3
0.4

FIGURE C-17

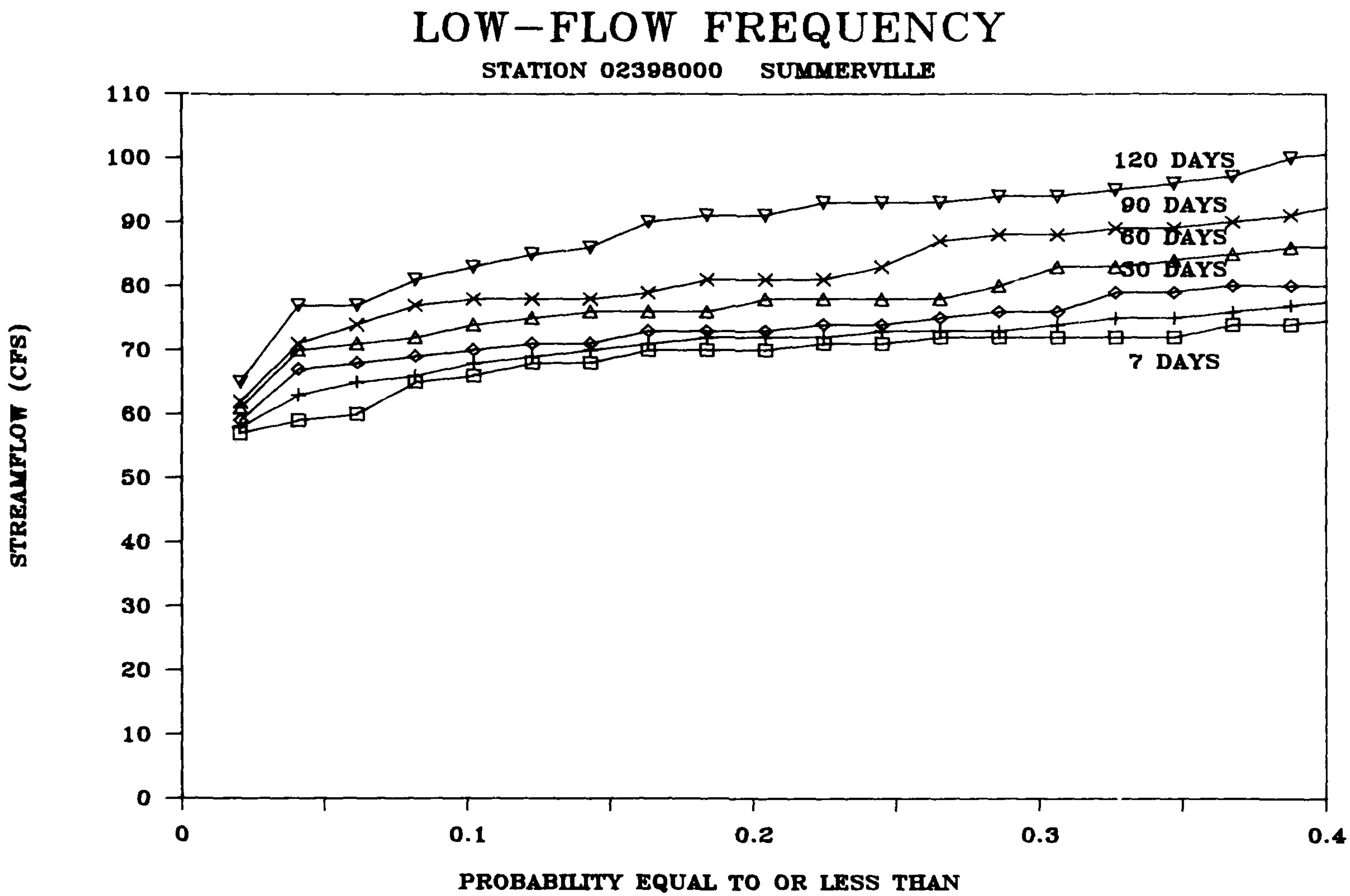

LOW-FLOW FREQUENCY
STATION 02398000 SUMMERVILLE
STREAMFLOW (CFS)
PROBABILITY EQUAL TO OR LESS THAN
120 DAYS
90 DAYS
60 DAYS
30 DAYS
7 DAYS
0
10
20
30
40
50
60
70
80
90
100
110
0
0.1
0.2
0.3
0.4

FIGURE C-18

APPENDIX D

DURATION-PROBABILITY CURVES

APPENDIX D

DURATION-PROBABILITY CURVES

Contents

Note: Three stations with short records are not included: Station 02384500, Eton; Station 02388320, Armuchee; Station 02395120, Kingston.

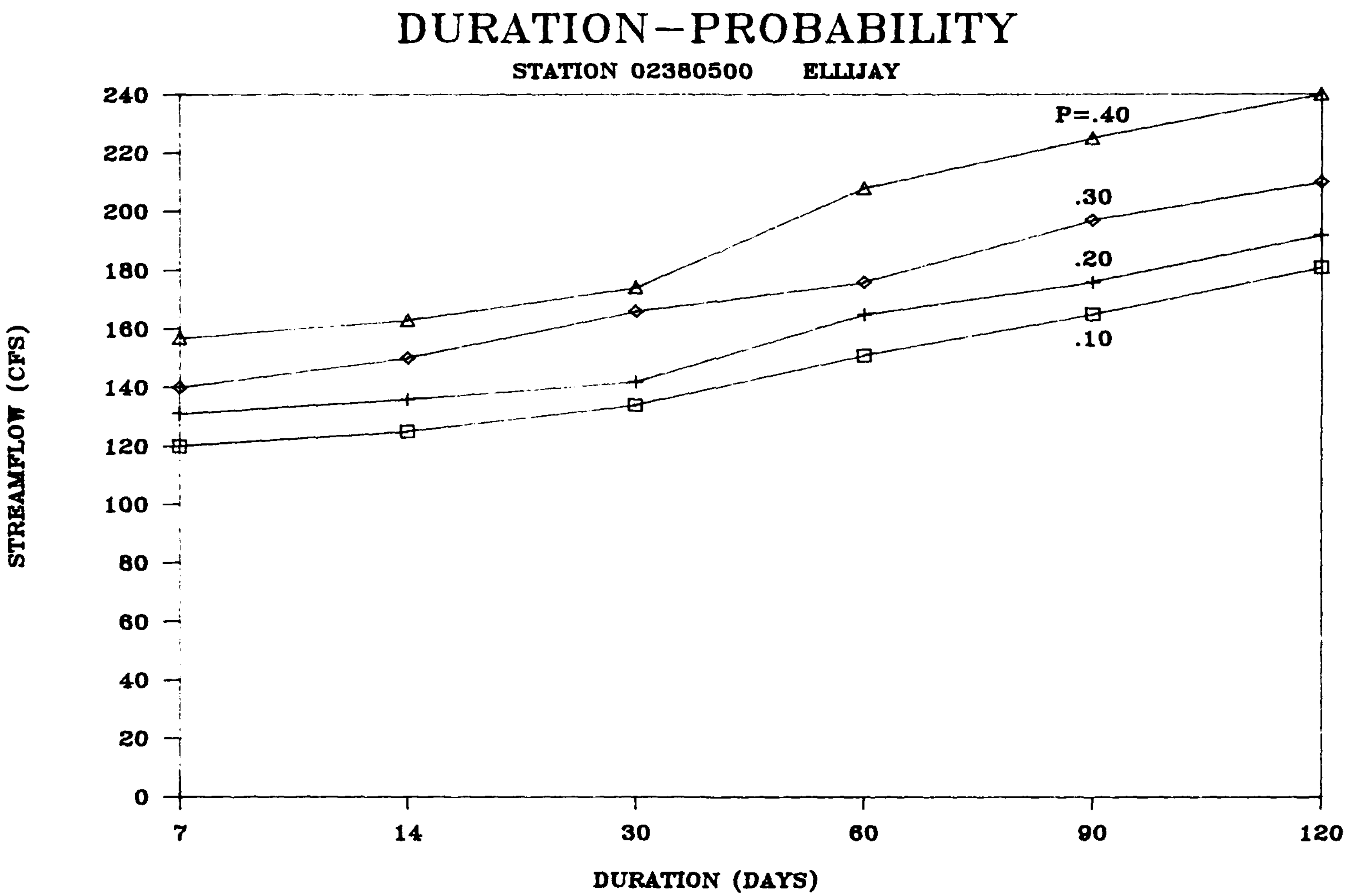

DURATION–PROBABILITY
STATION 02380500 ELLIJAY
240
220
200
180
160
140
120
100
80
60
40
20
0
STREAMFLOW (CFS)
7
14
30
60
90
120
DURATION (DAYS)
P=.40
.30
.20
.10

FIGURE D-1

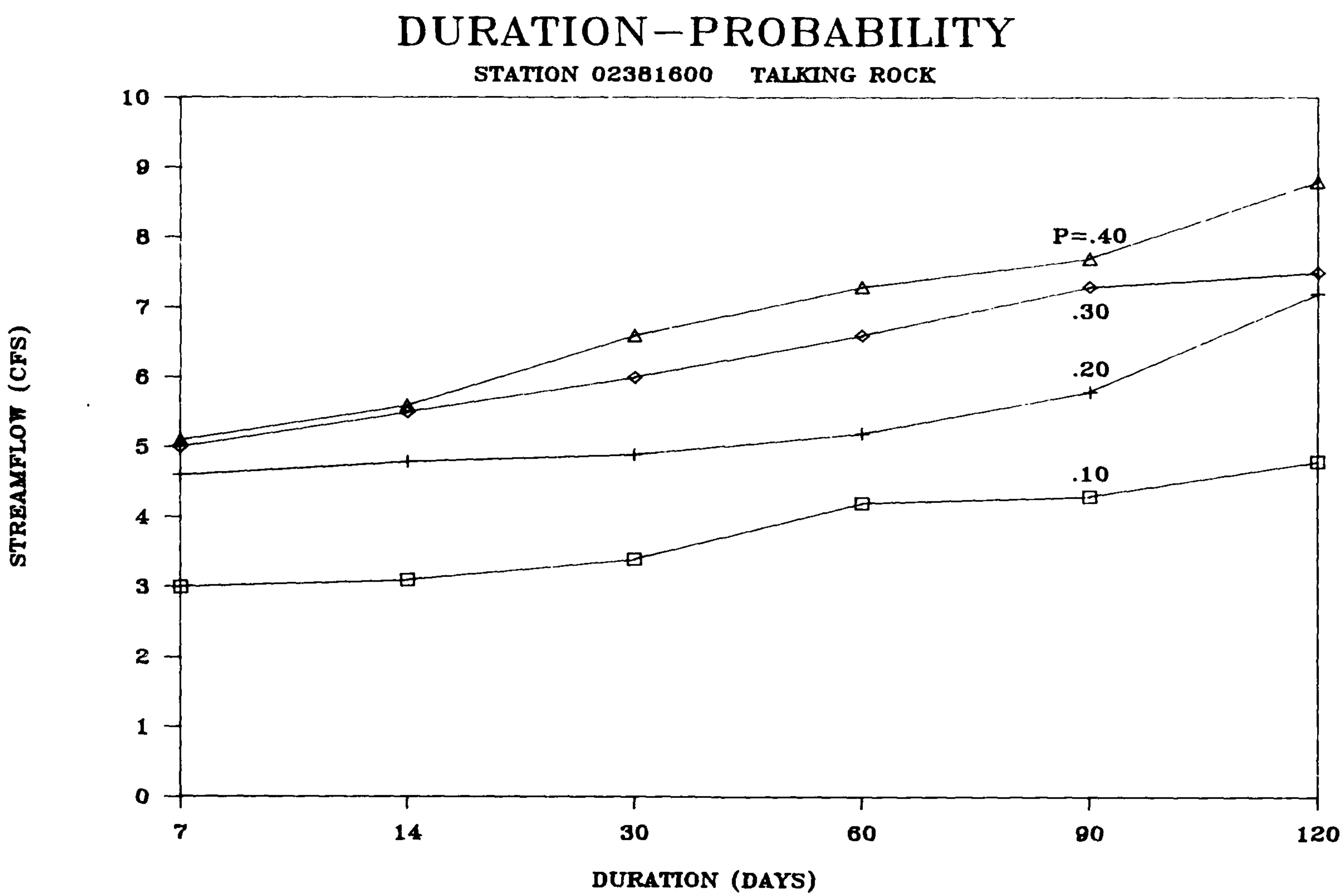
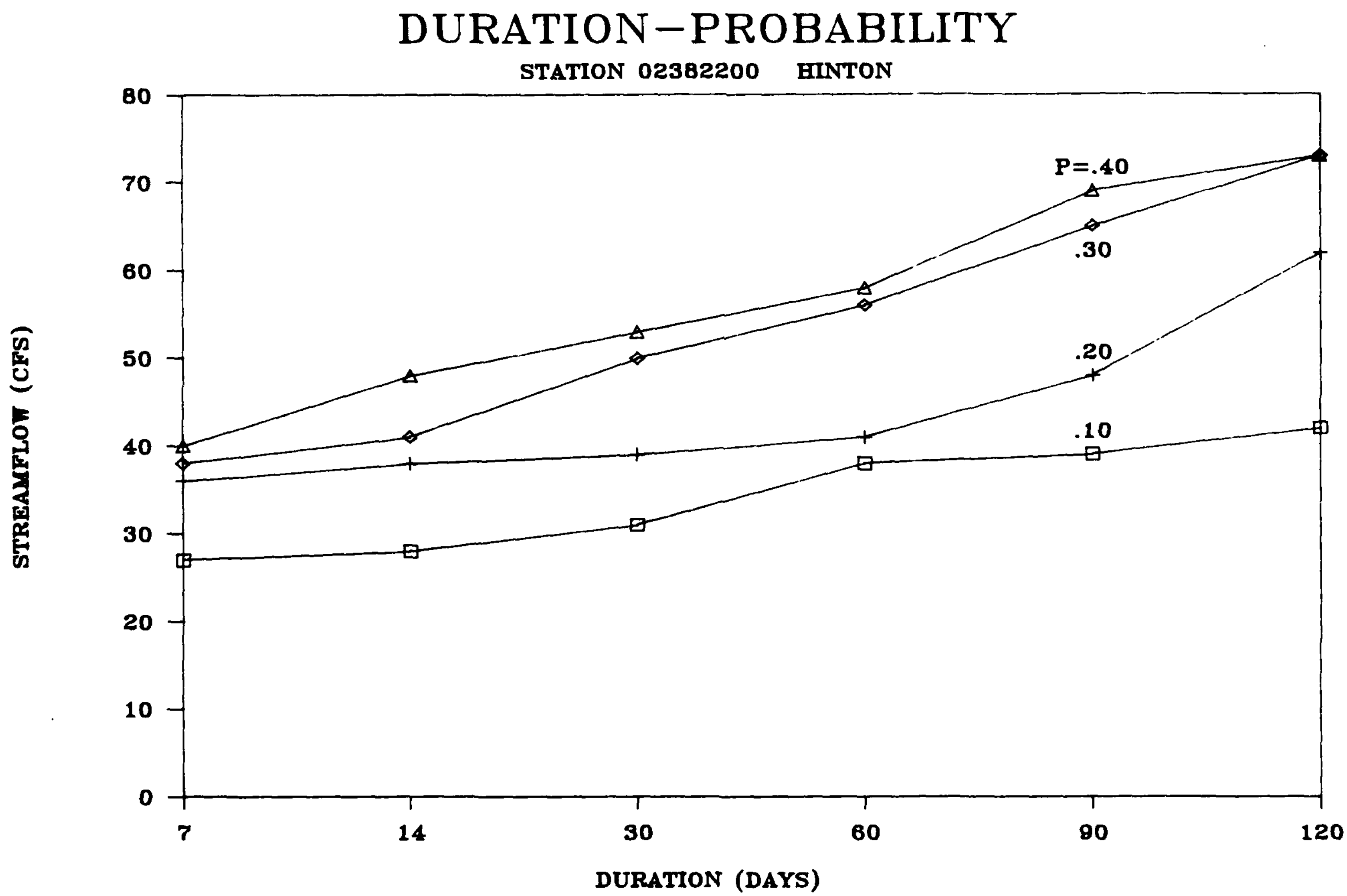

DURATION-PROBABILITY
STATION 02381600 TALKING ROCK
10
9
8
7
6
5
4
3
2
1
0
STREAMFLOW (CFS)
7
14
30
60
90
120
DURATION (DAYS)
P=.40
.30
.20
.10

FIGURE D-2



DURATION–PROBABILITY
STATION 02382200 HINTON
STREAMFLOW (CFS)
DURATION (DAYS)
0
10
20
30
40
50
60
70
80
7
14
30
60
90
120
P=.40
.30
.20
.10

FIGURE D-3

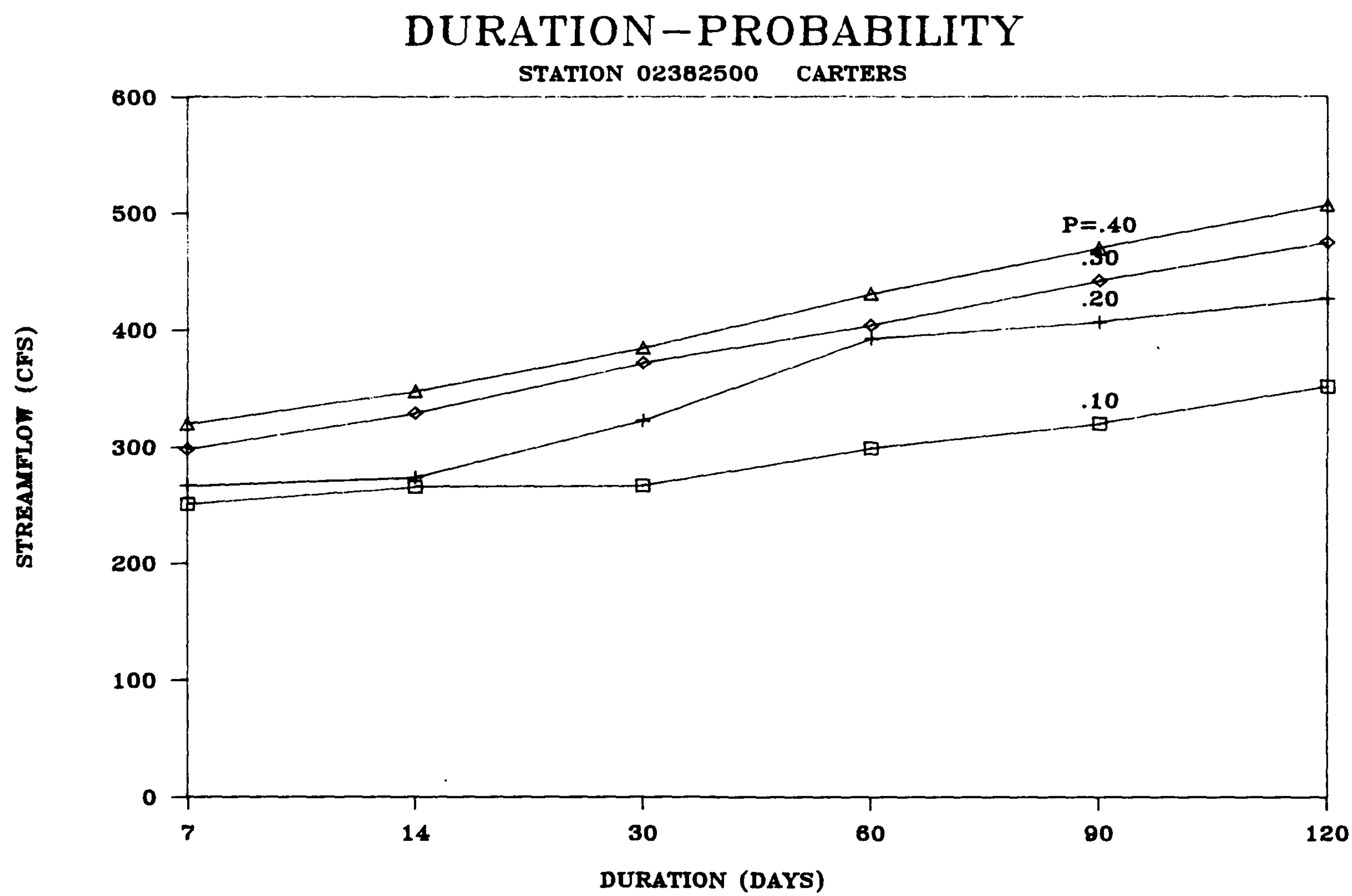
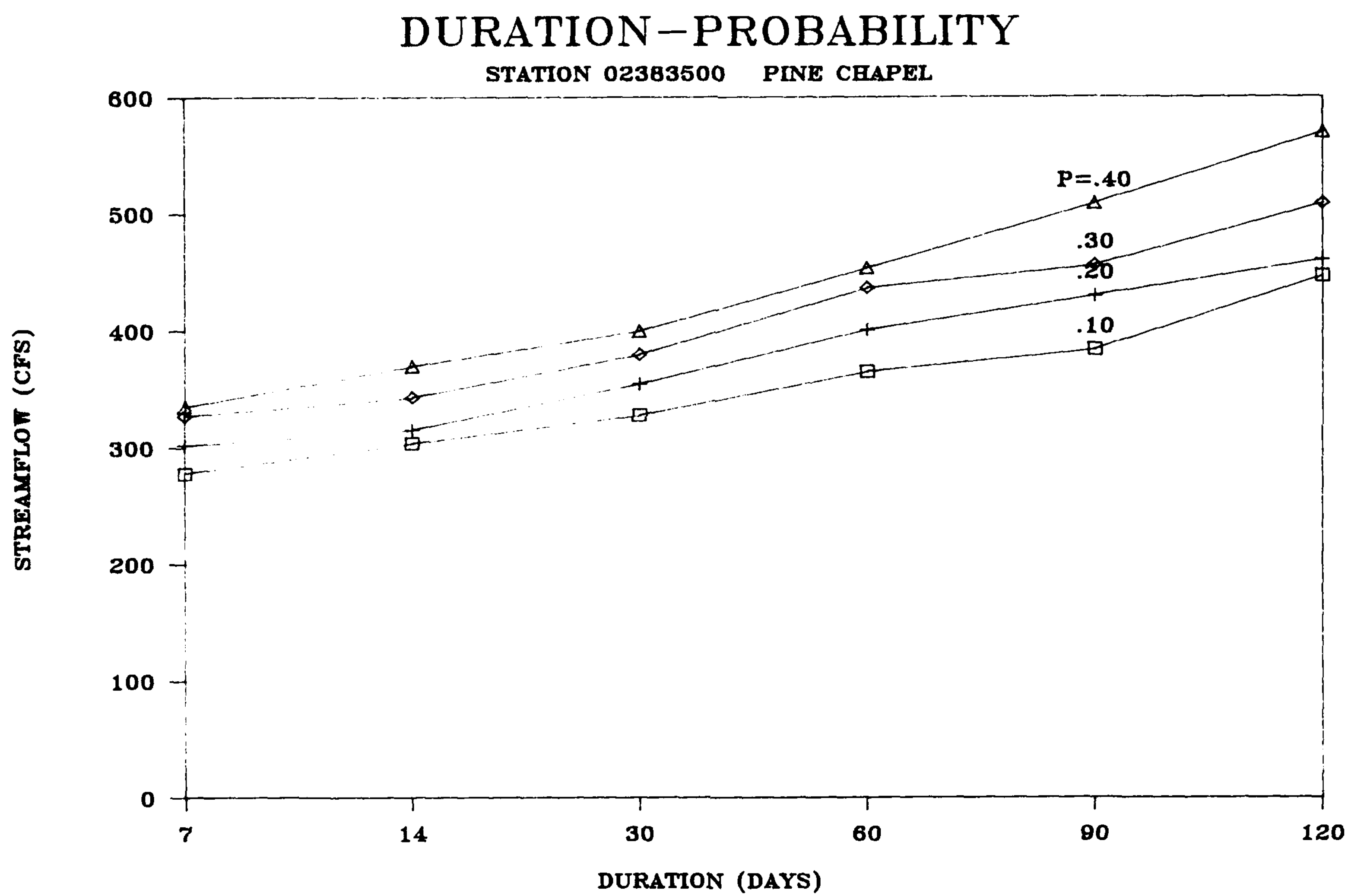

DURATION-PROBABILITY
STATION 02382500 CARTERS
STREAMFLOW (CFS)
0
100
200
300
400
500
600
7
14
30
60
90
120
DURATION (DAYS)
P=.40
.30
.20
.10

FIGURE D-4



DURATION–PROBABILITY
STATION 02383500 PINE CHAPEL
STREAMFLOW (CFS)
0
100
200
300
400
500
600
DURATION (DAYS)
7
14
30
60
90
120
P=.40
.30
.20
.10

FIGURE D-5

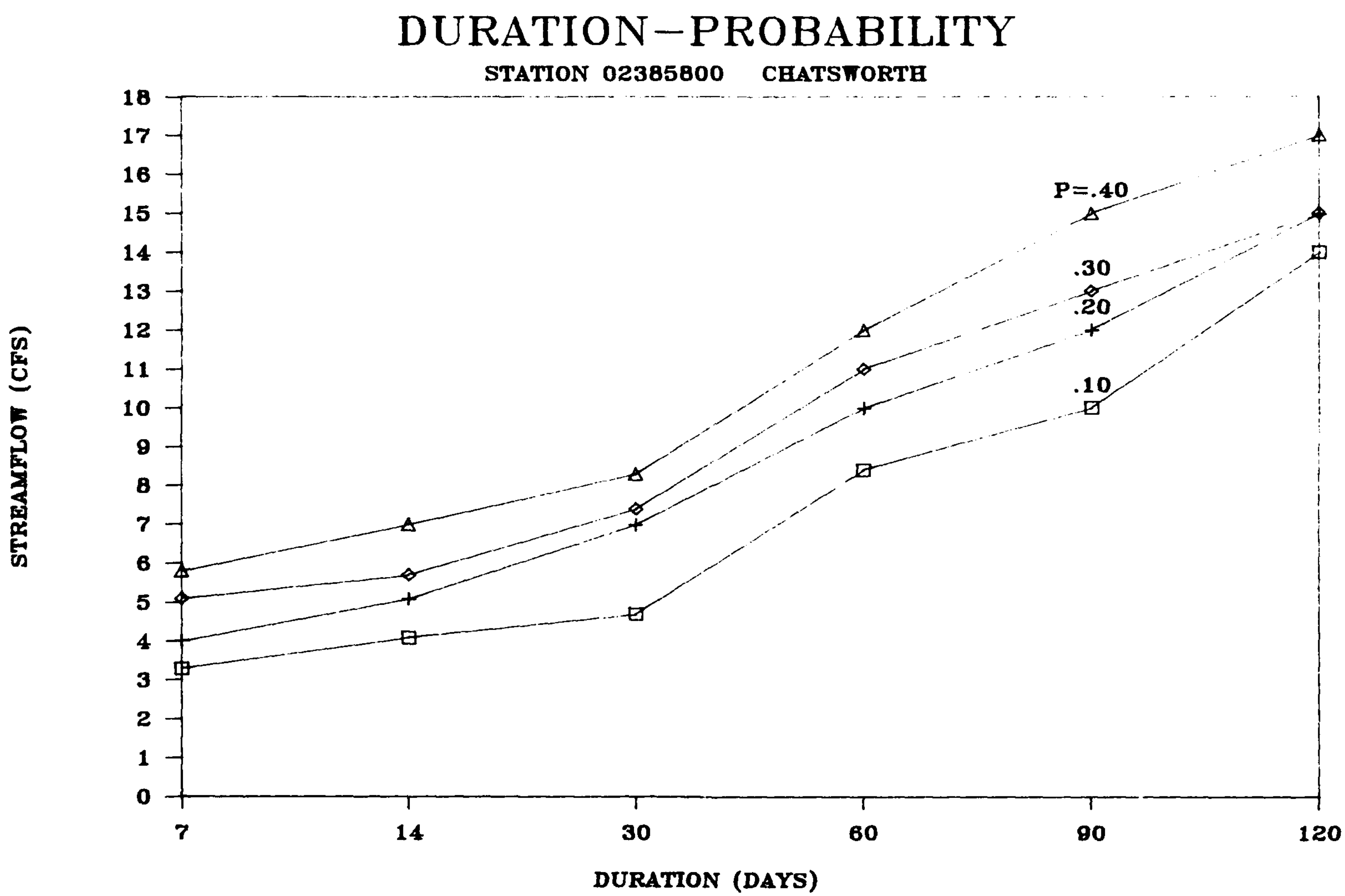

DURATION—PROBABILITY
STATION 02385800 CHATSWORTH
STREAMFLOW (CFS)
DURATION (DAYS)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
7
14
30
60
90
120
P=.40
.30
.20
.10

FIGURE D-6

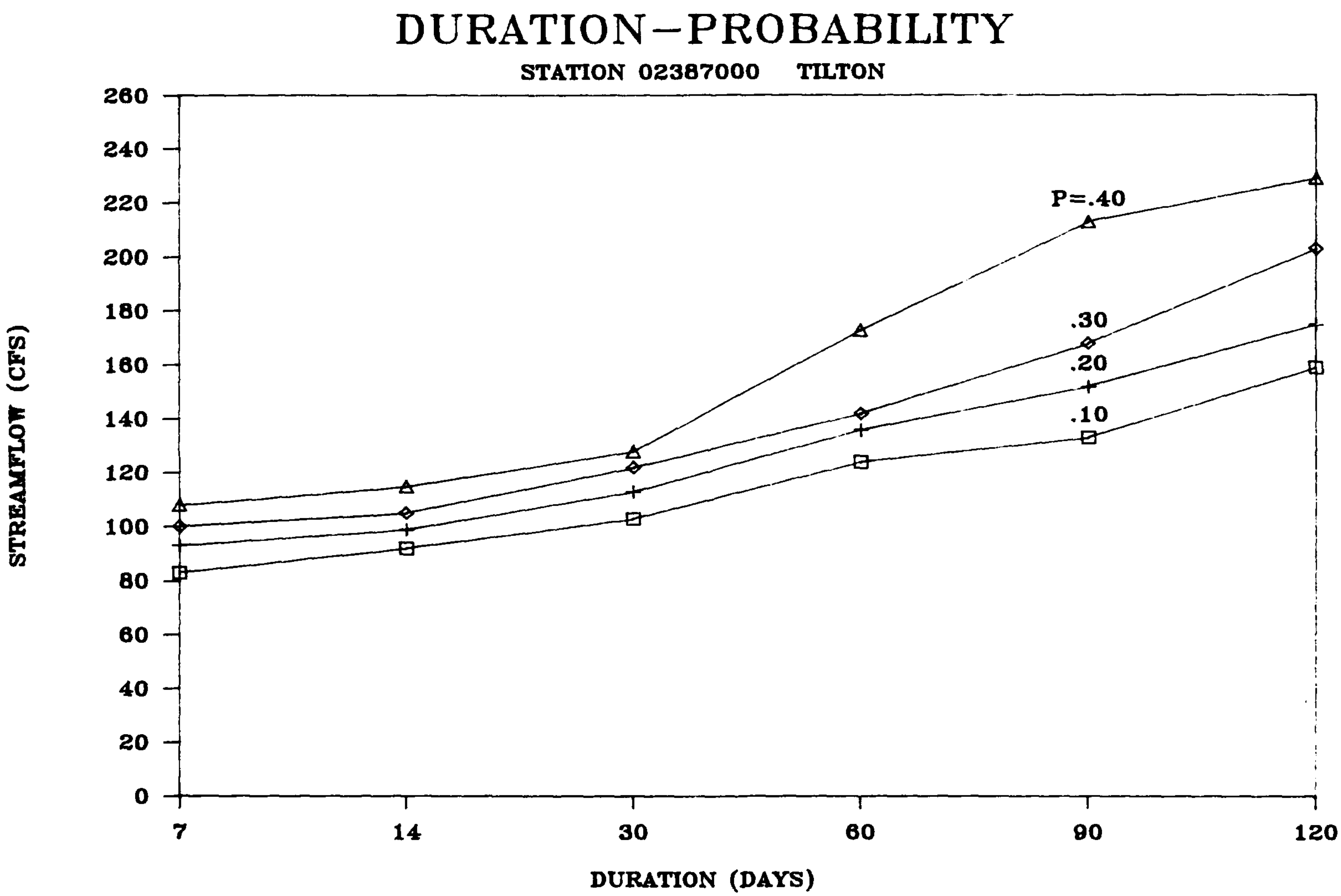
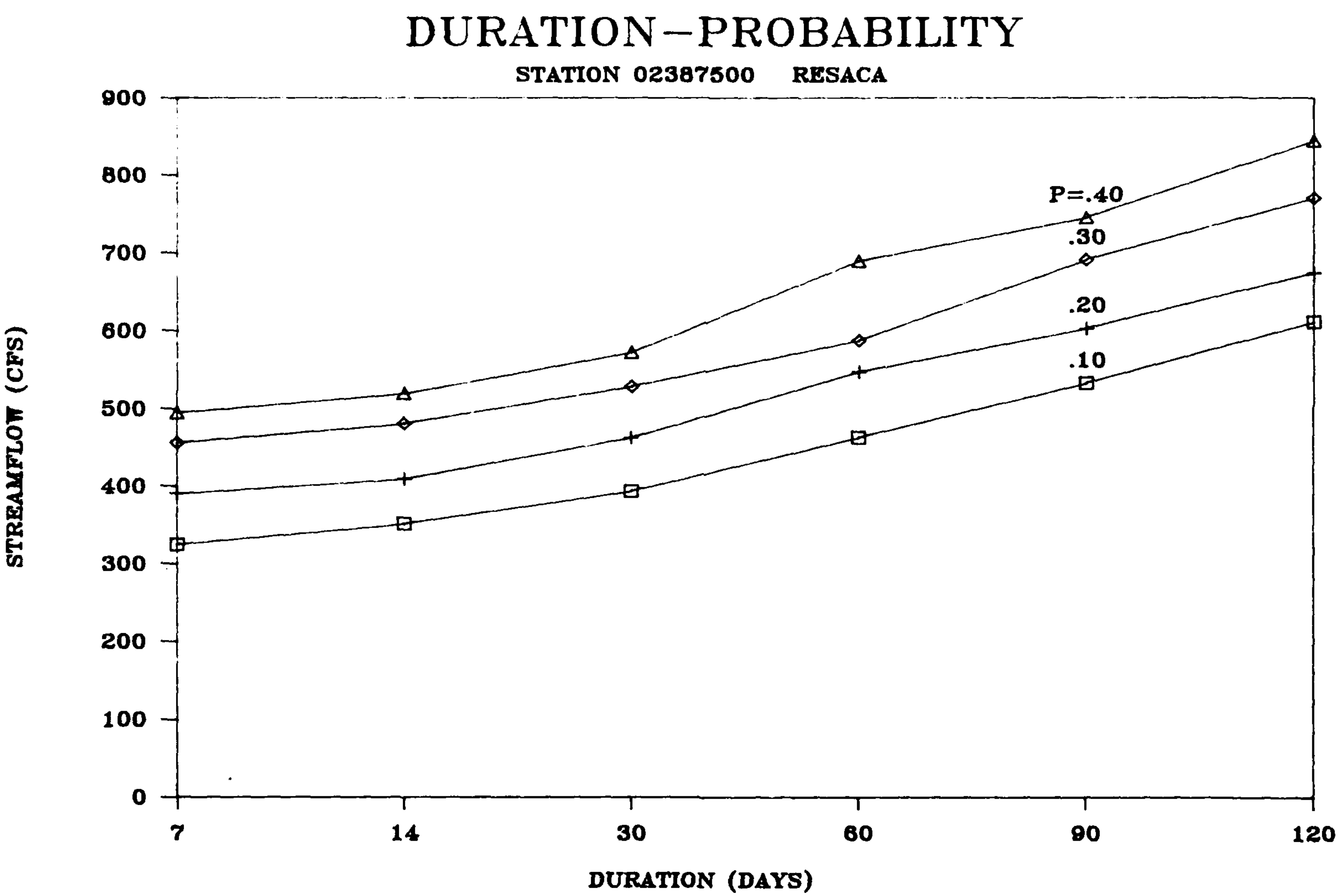

DURATION-PROBABILITY
STATION 02387000 TILTON
STREAMFLOW (CFS)
260
240
220
200
180
160
140
120
100
80
60
40
20
0
7
14
30
60
90
120
DURATION (DAYS)
P=.40
.30
.20
.10

FIGURE D-7



DURATION-PROBABILITY
STATION 02387500 RESACA
900
800
700
600
500
400
300
200
100
0
STREAMFLOW (CFS)
7
14
30
60
90
120
DURATION (DAYS)
P=.40
.30
.20
.10

FIGURE D-8

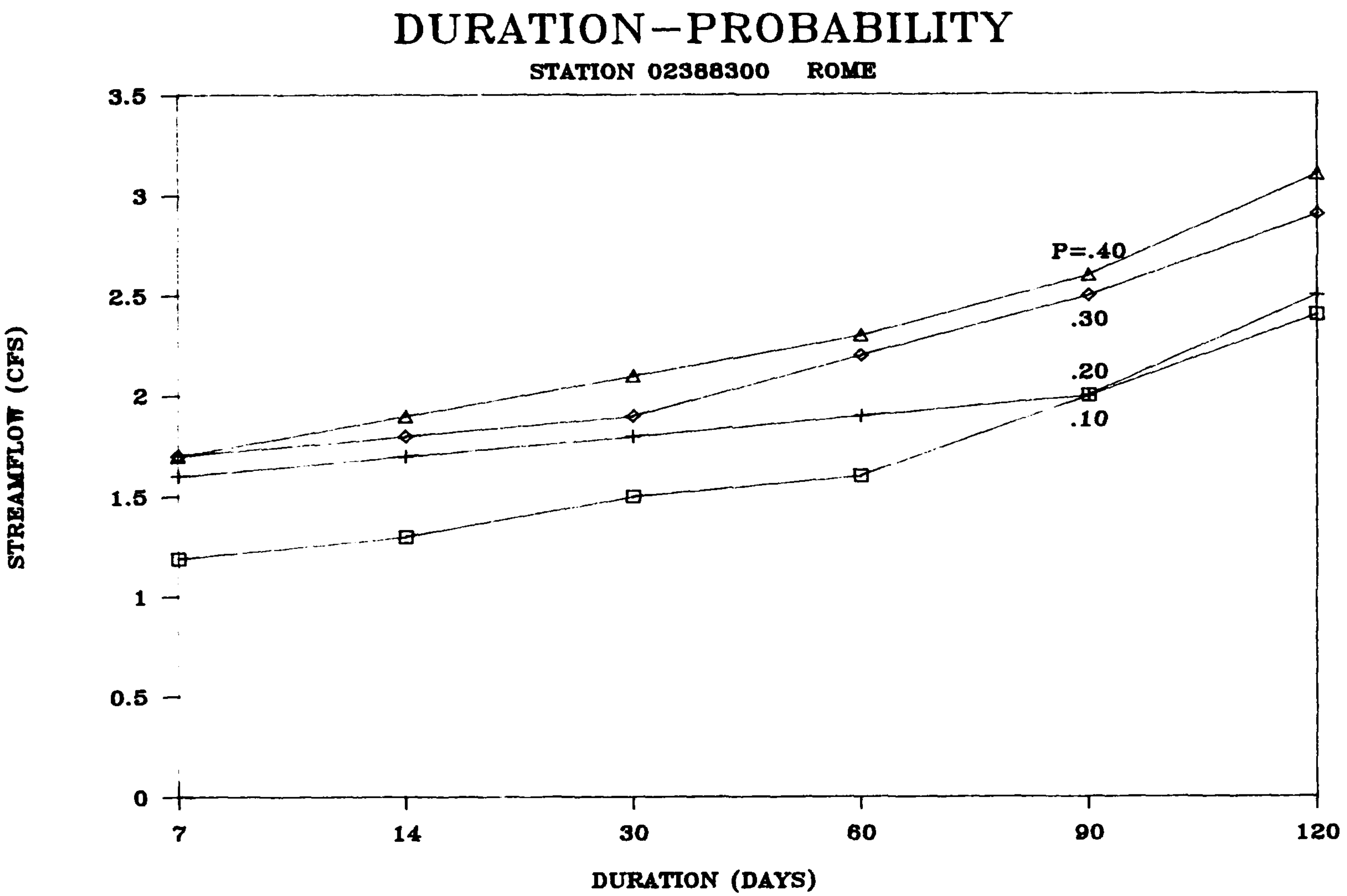
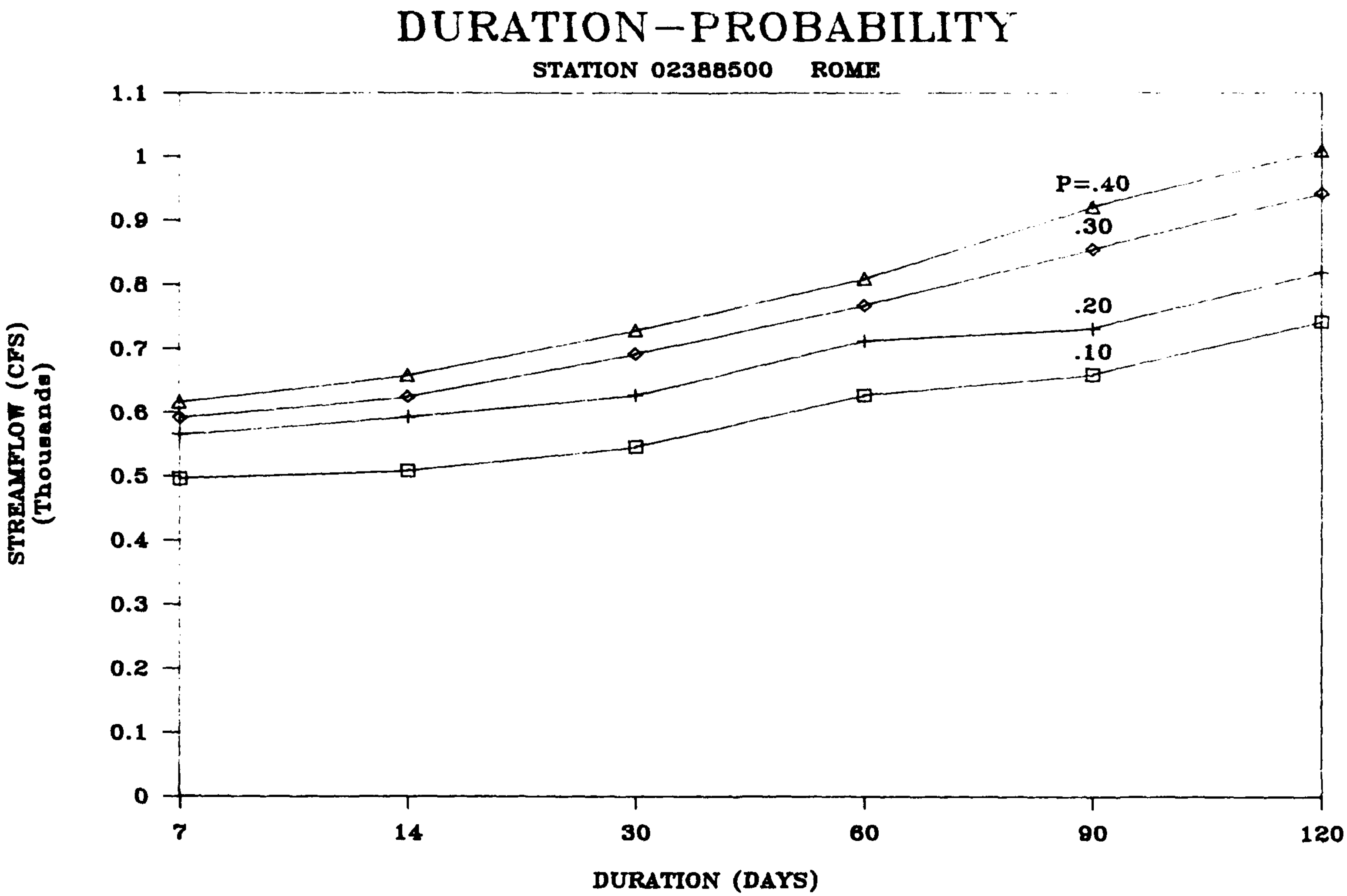
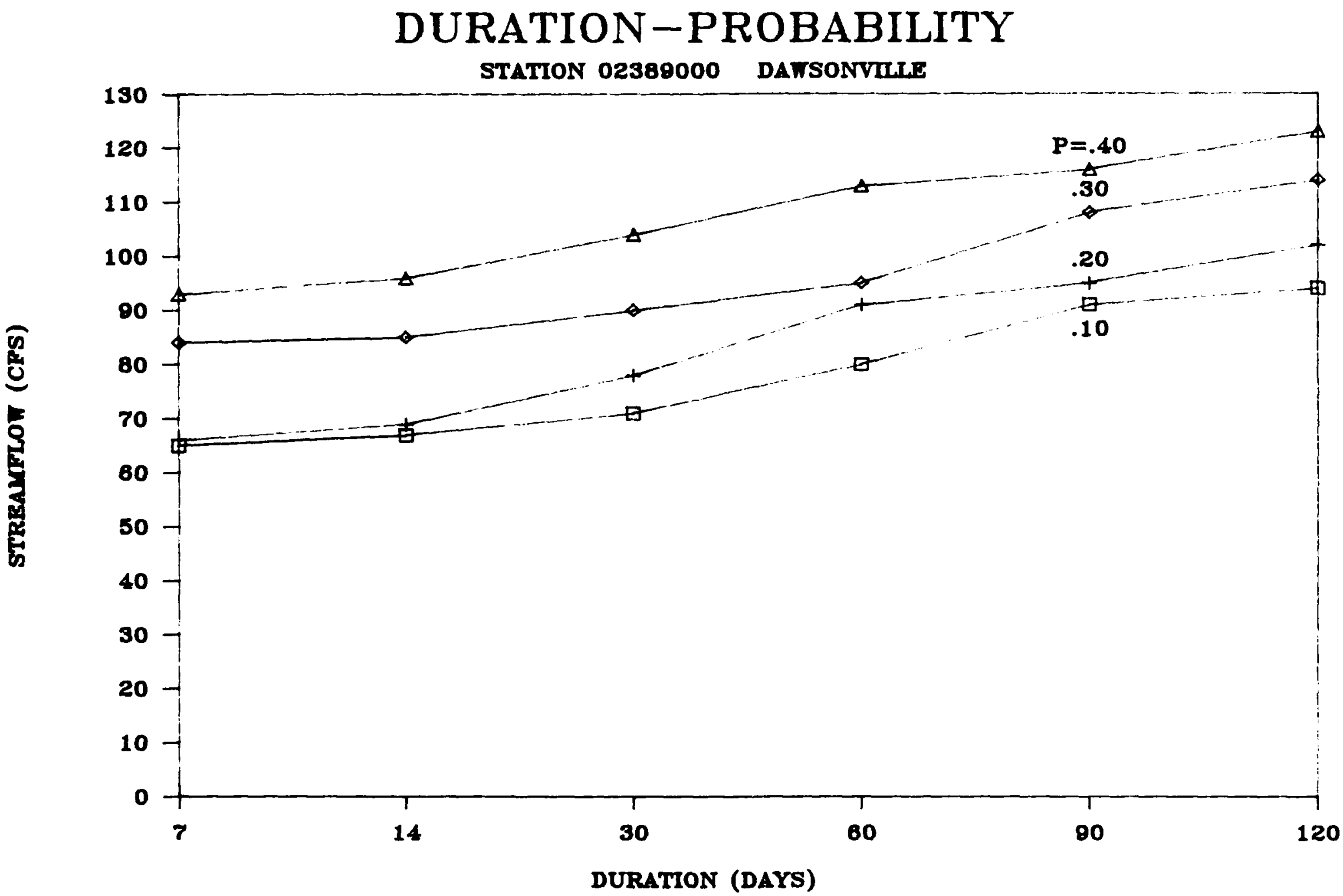

DURATION–PROBABILITY
STATION 02388300 ROME
STREAMFLOW (CFS)
3.5
3
2.5
2
1.5
1
0.5
0
7
14
30
60
90
120
DURATION (DAYS)
P=.40
.30
.20
.10

FIGURE D-9



DURATION–PROBABILITY
STATION 02388500 ROME
STREAMFLOW (CFS)
(Thousands)
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
7
14
30
60
90
120
DURATION (DAYS)
P=.40
.30
.20
.10

FIGURE D-10



DURATION-PROBABILITY
STATION 02389000 DAWSONVILLE
P=.40
.30
.20
.10
STREAMFLOW (CFS)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
7
14
30
60
90
120
DURATION (DAYS)

FIGURE D-11

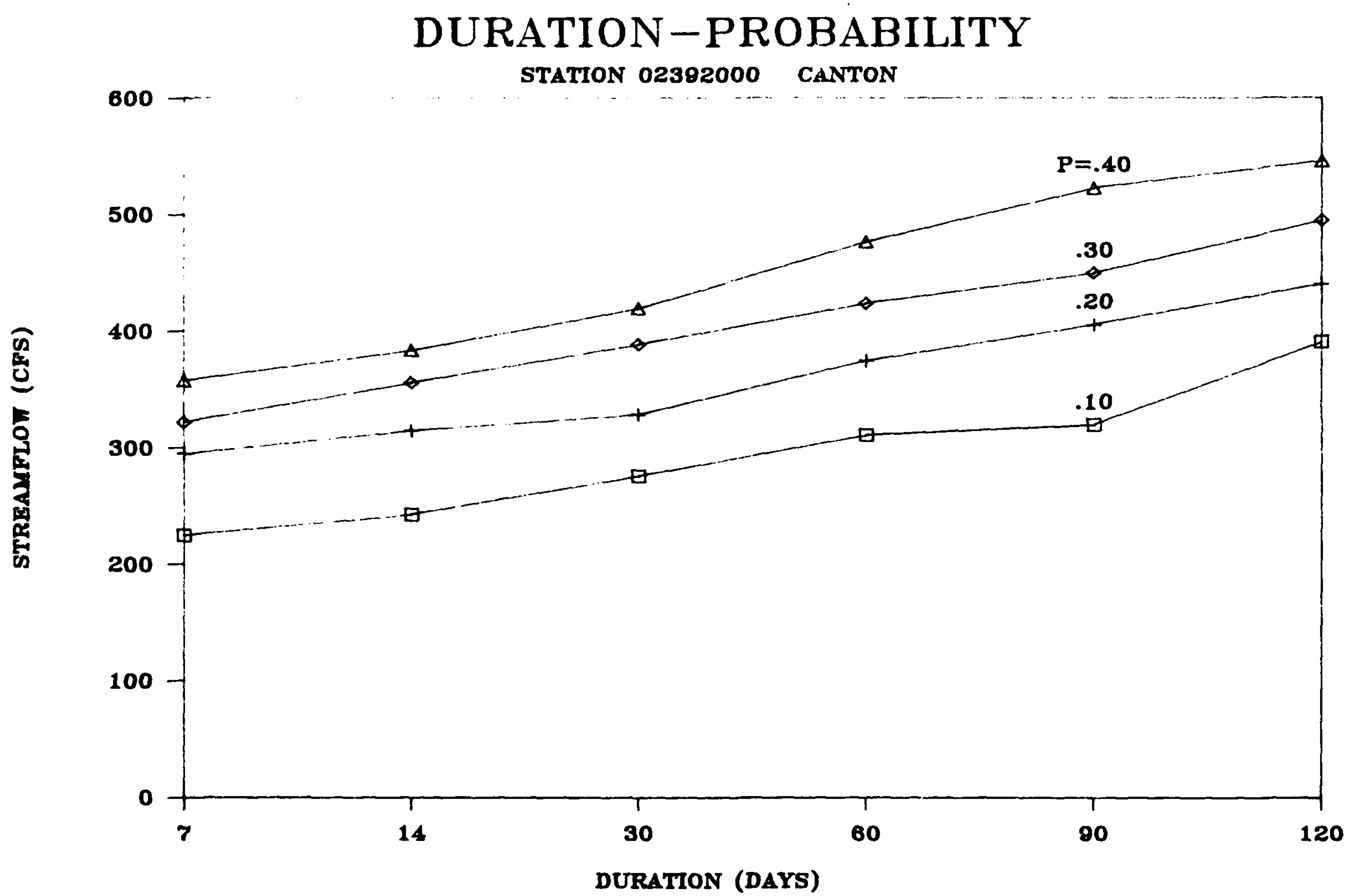
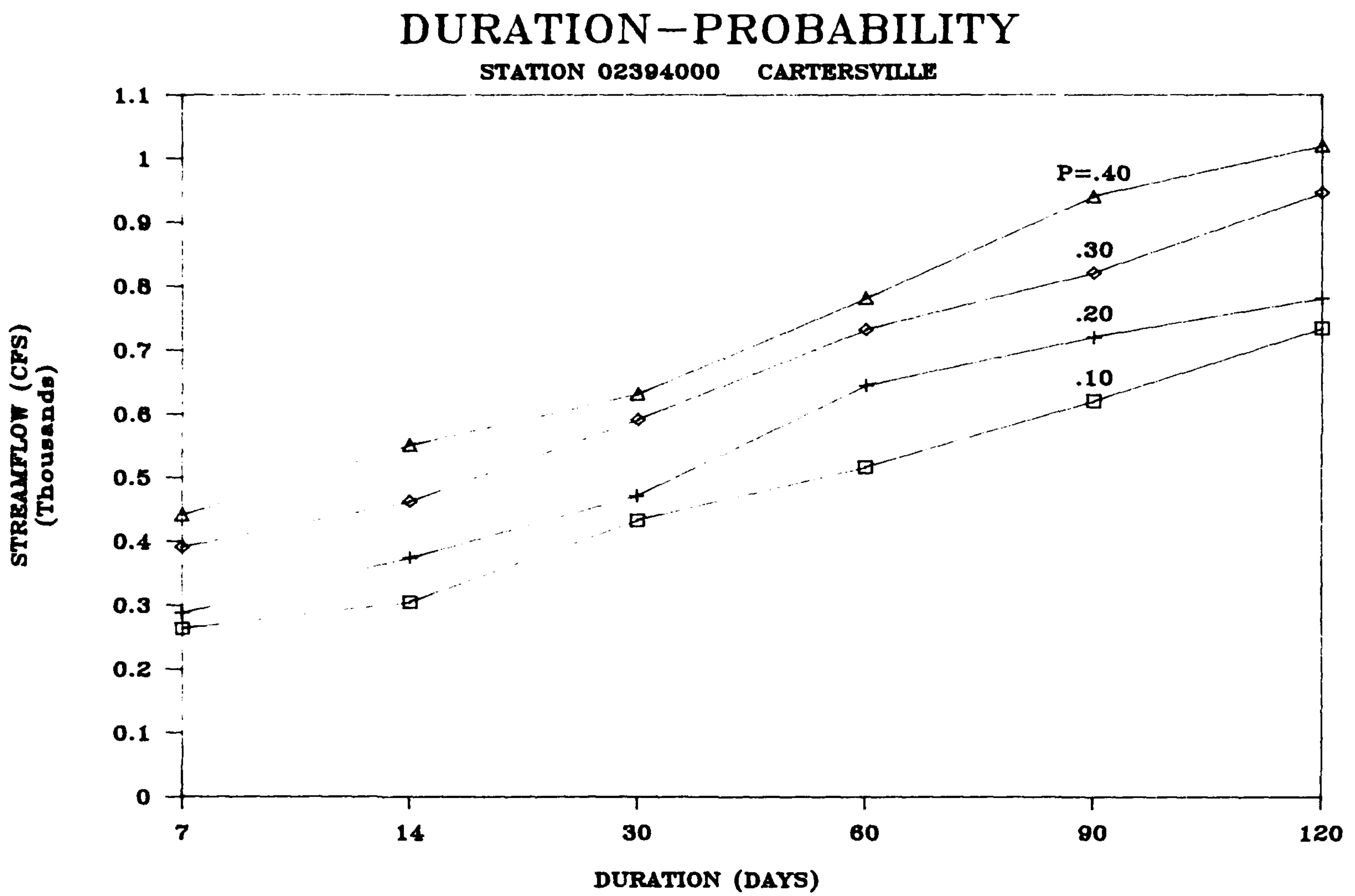

DURATION-PROBABILITY
STATION 02392000 CANTON
STREAMFLOW (CFS)
600
500
400
300
200
100
0
DURATION (DAYS)
7
14
30
60
90
120
P=.40
.30
.20
.10

FIGURE D-12



DURATION-PROBABILITY
STATION 02394000 CARTERSVILLE
STREAMFLOW (CFS)
(Thousands)
DURATION (DAYS)
P=.40
.30
.20
.10
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
7
14
30
60
90
120

FIGURE D-13

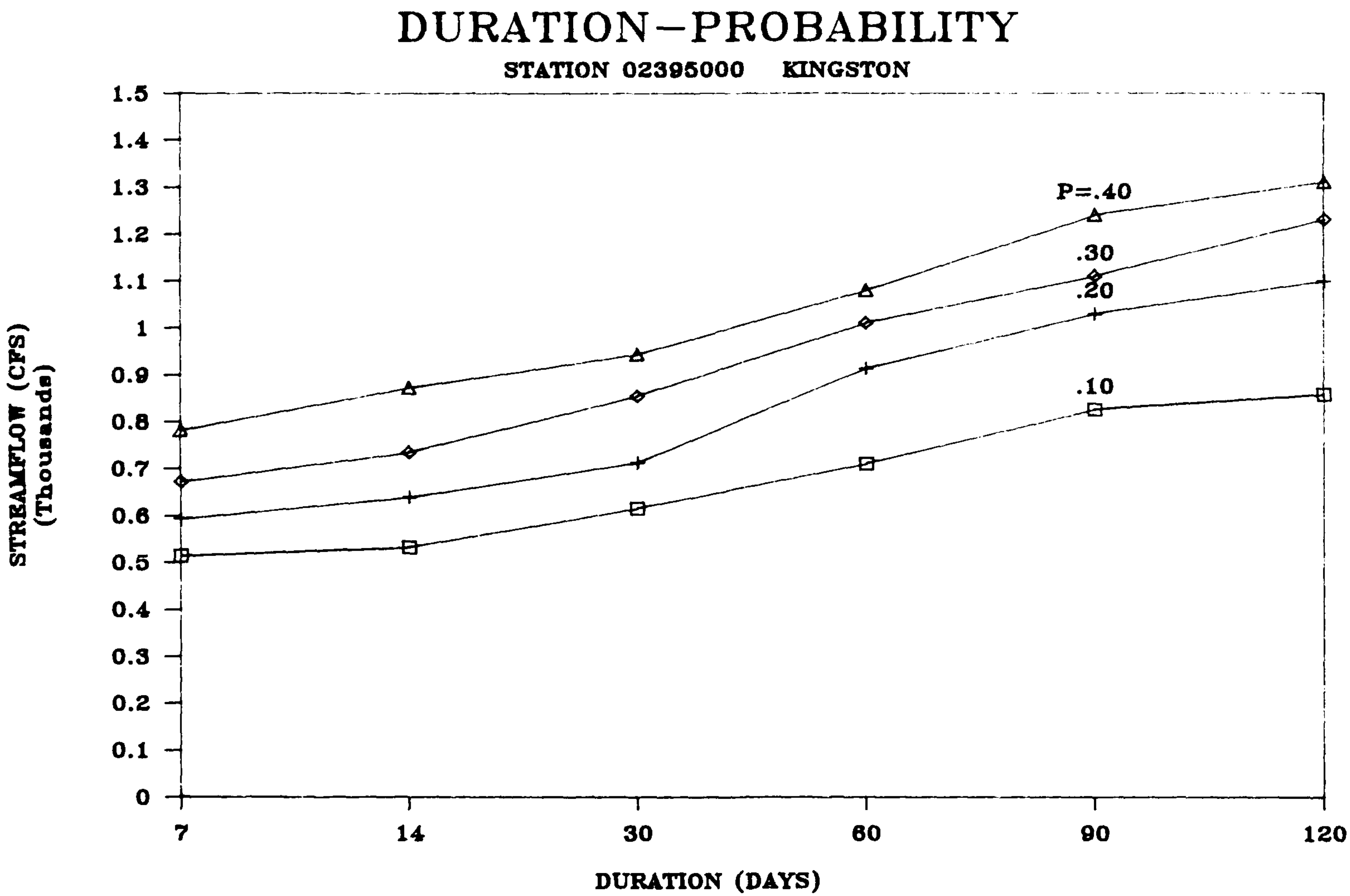

DURATION-PROBABILITY
STATION 02395000 KINGSTON
STREAMFLOW (CFS)
(Thousands)
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
P=.40
.30
.20
.10
7
14
30
60
90
120
DURATION (DAYS)

FIGURE D-14

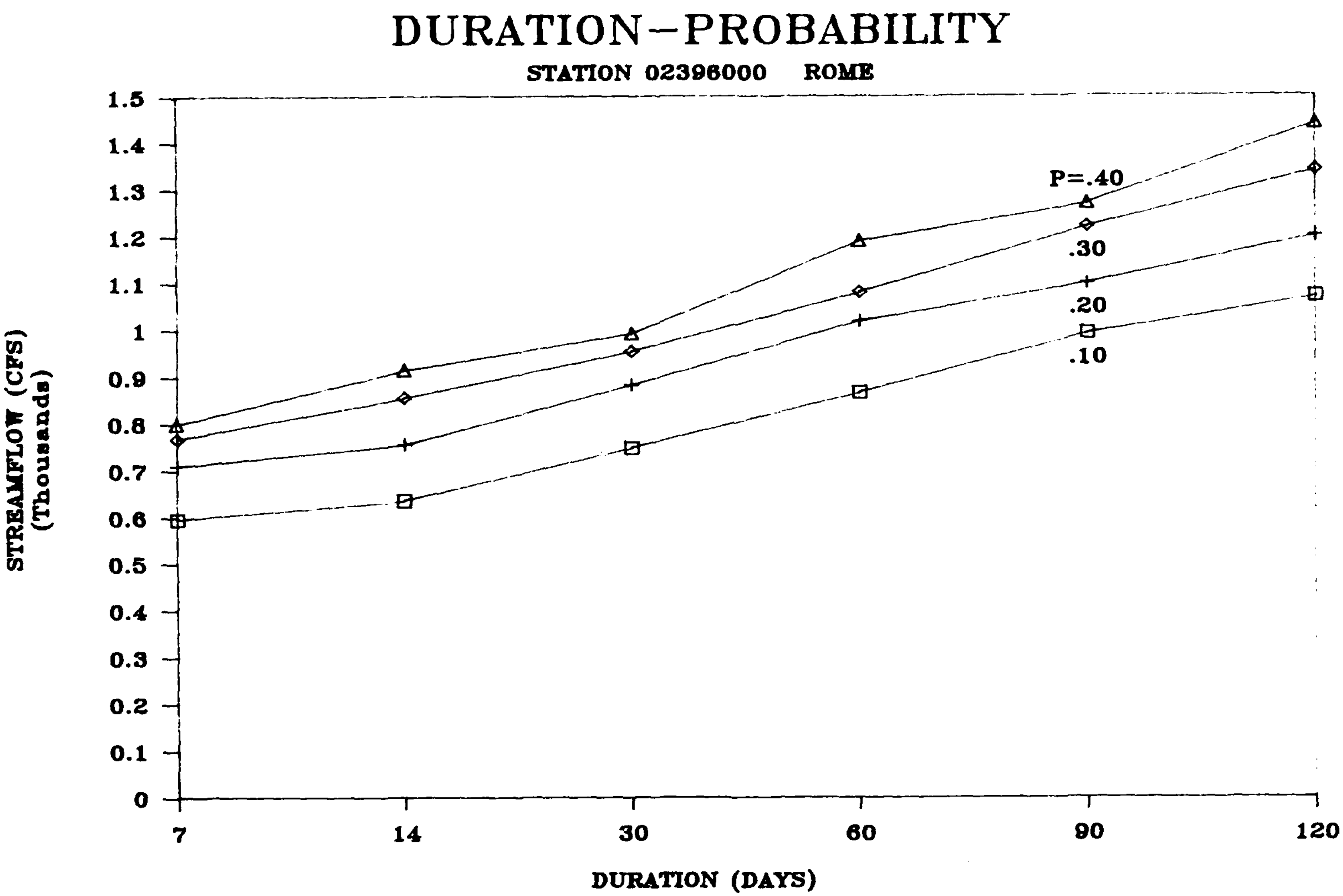

DURATION–PROBABILITY
STATION 02396000 ROME
STREAMFLOW (CFS)
(Thousands)
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
7
14
30
60
90
120
DURATION (DAYS)
P=.40
.30
.20
.10

FIGURE D-15

DURATION–PROBABILITY

STATION 02397000 ROME

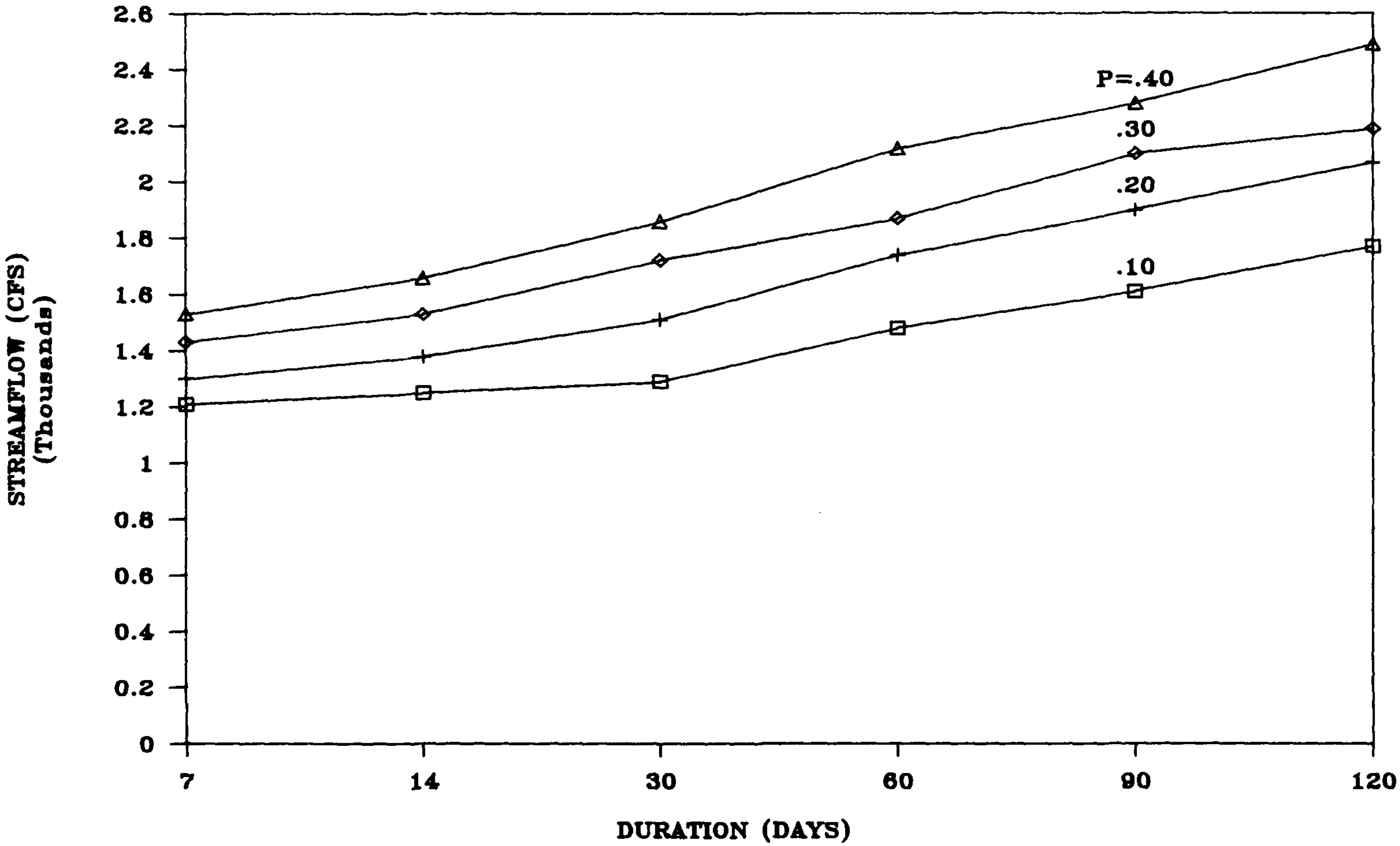


FIGURE D-16

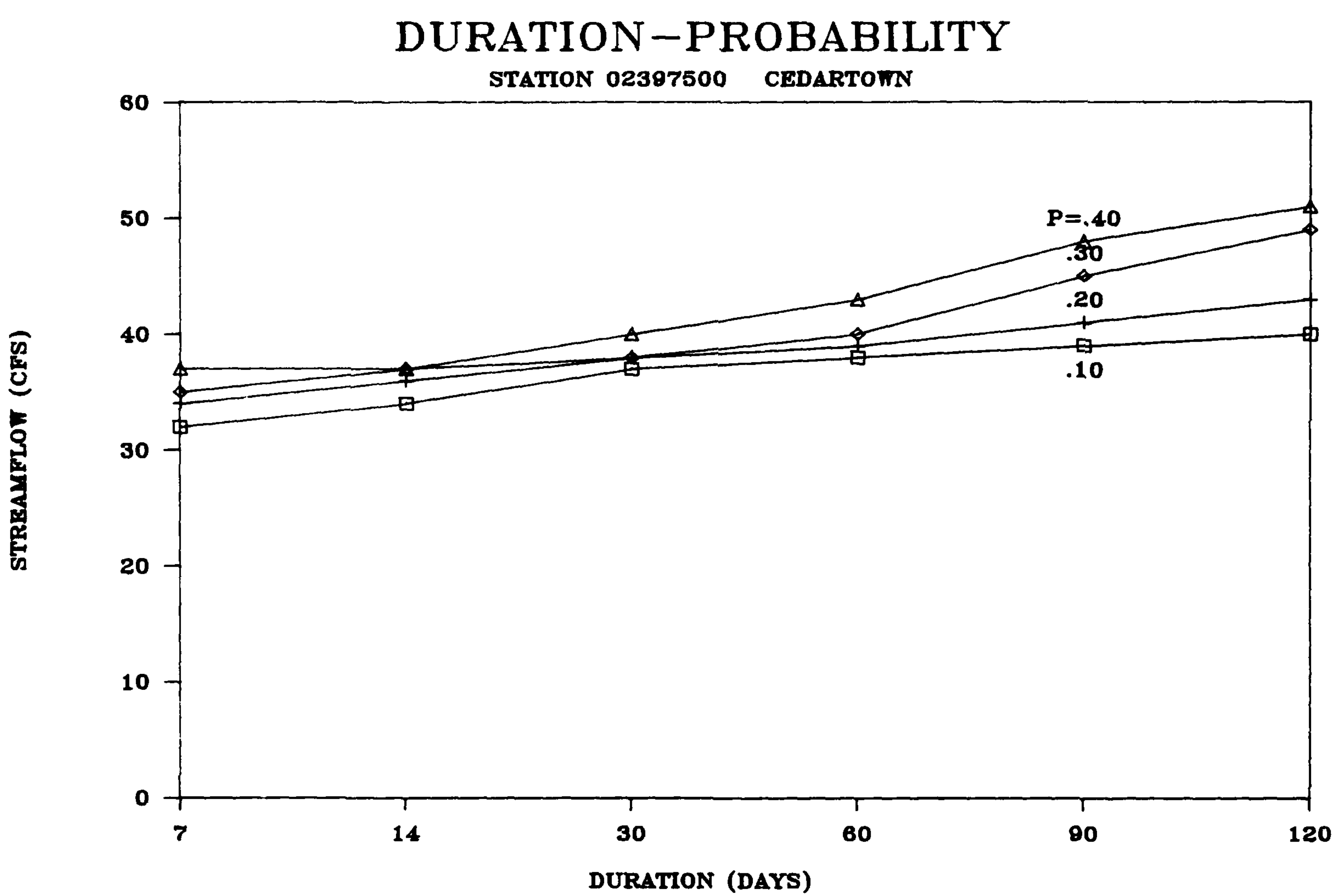

DURATION-PROBABILITY
STATION 02397500 CEDARTOWN
60
50
40
30
20
10
0
7
14
30
60
90
120
STREAMFLOW (CFS)
DURATION (DAYS)
P=.40
.30
.20
.10

FIGURE D-17

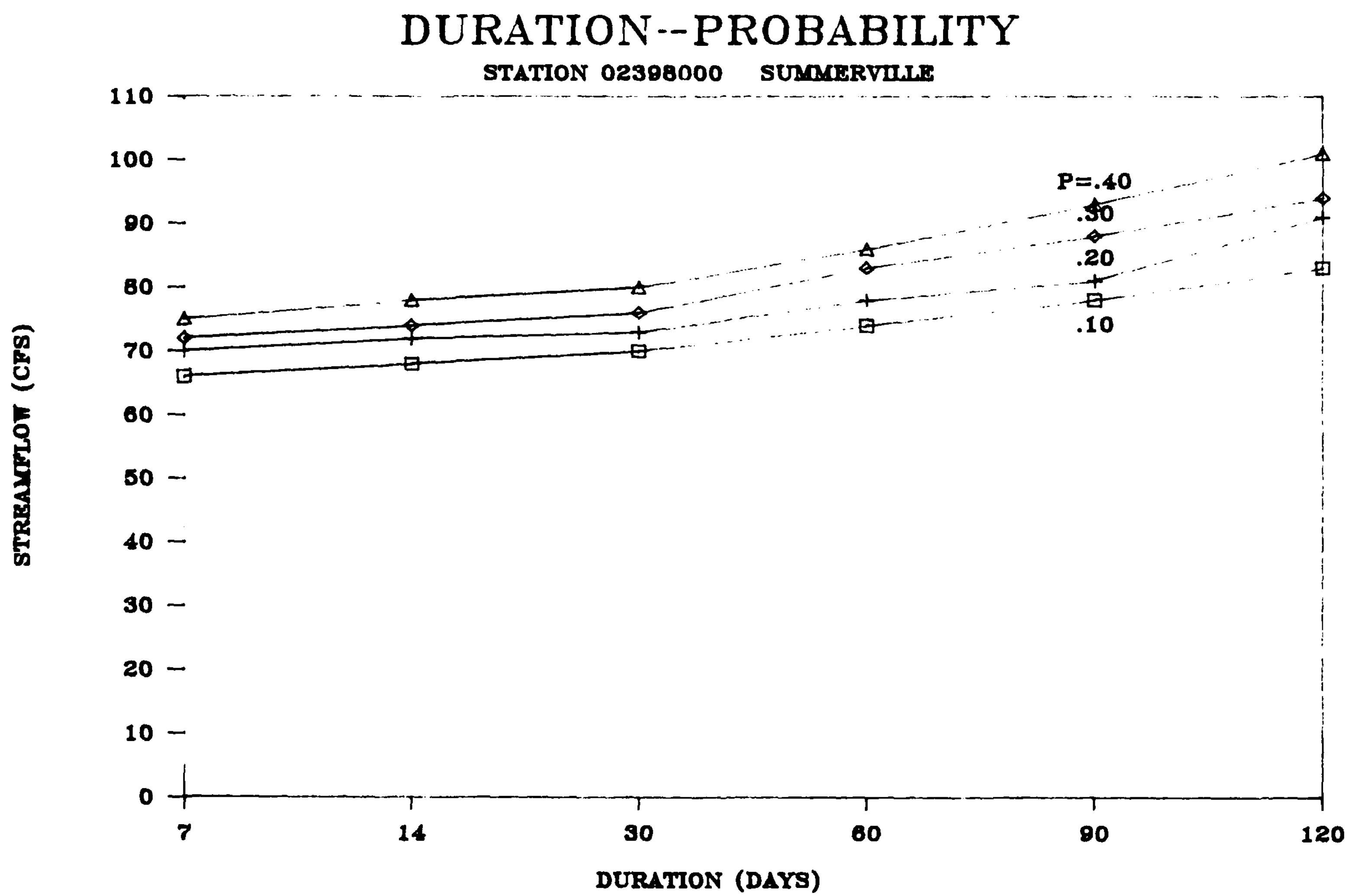

DURATION--PROBABILITY
STATION 02398000 SUMMERVILLE
STREAMFLOW (CFS)
110
100
90
80
70
60
50
40
30
20
10
0
7
14
30
60
90
120
DURATION (DAYS)
P=.40
.30
.20
.10

FIGURE D-18

APPENDIX E

FLOW-DURATION CURVES

APPENDIX E

FLOW-DURATION CURVES

Contents

COMPARISON: ANNUAL VS. JUNE-NOVEMBER DATA

E-22	02382500	Carters	E-22
E-23	02383500	Pine Chapel	E-23
E-24	02387000	Tilton	E-24
E-25	02387500	Resaca	E-25
E-26	02388500	Rome	E-26
E-27	02386000	Rome	E-27
E-28	02397000	Rome	E-28

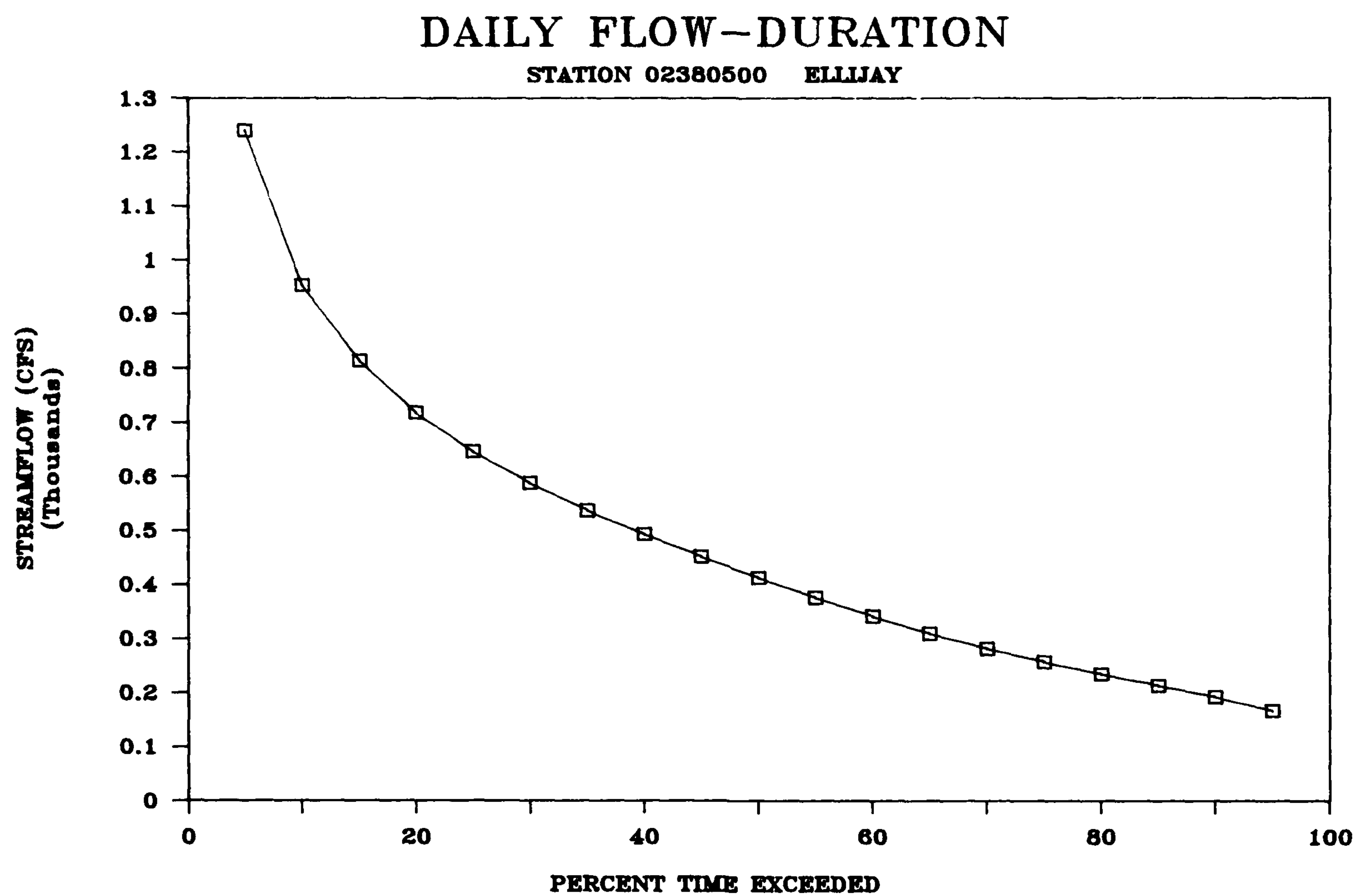
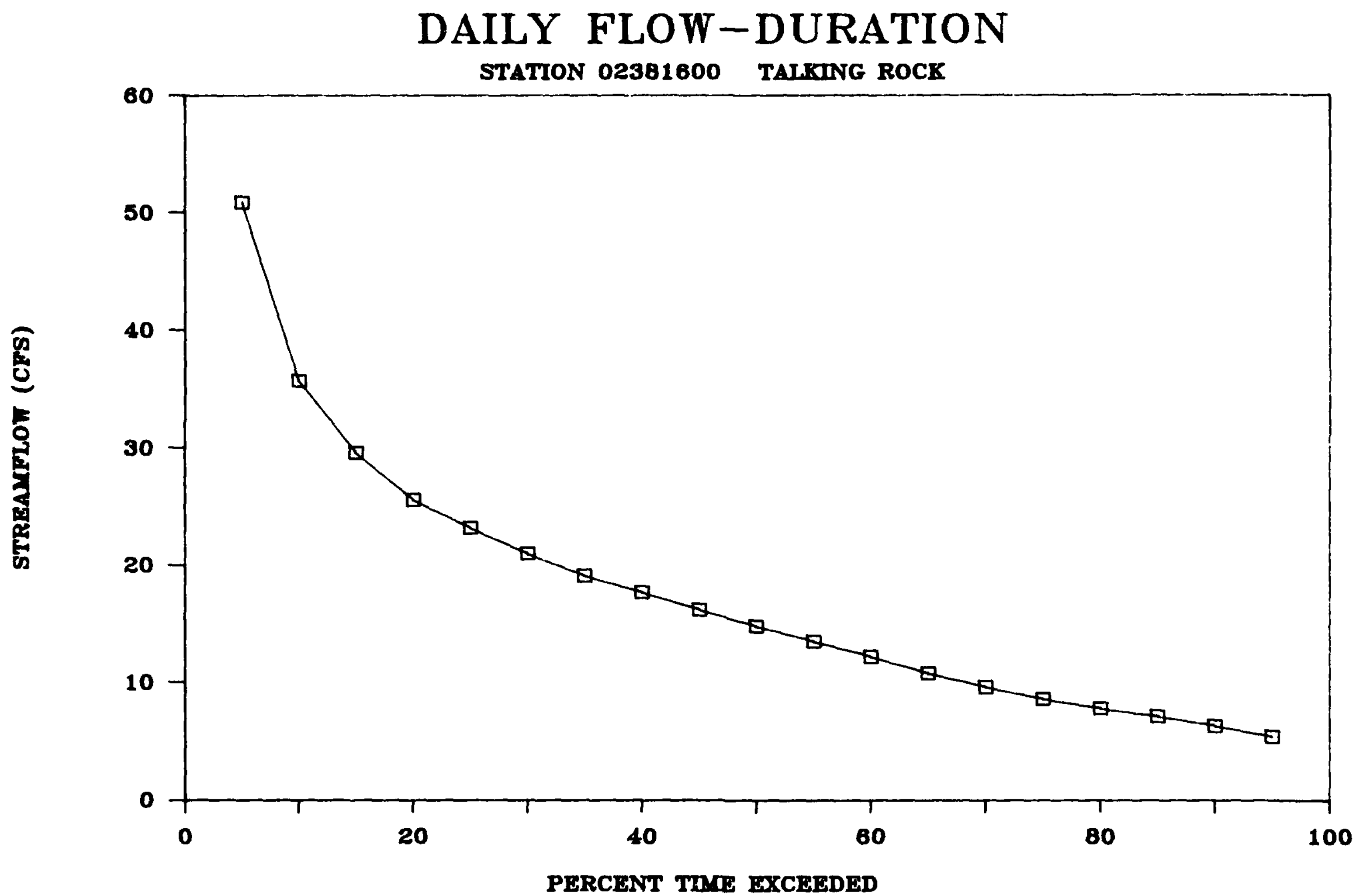

DAILY FLOW-DURATION
STATION 02380500 ELLIJAY
STREAMFLOW (CFS)
(Thousands)
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
20
40
60
80
100
PERCENT TIME EXCEEDED

FIGURE E-1



DAILY FLOW–DURATION
STATION 02381600 TALKING ROCK
STREAMFLOW (CFS)
60
50
40
30
20
10
0
0
20
40
60
80
100
PERCENT TIME EXCEEDED

FIGURE E-2

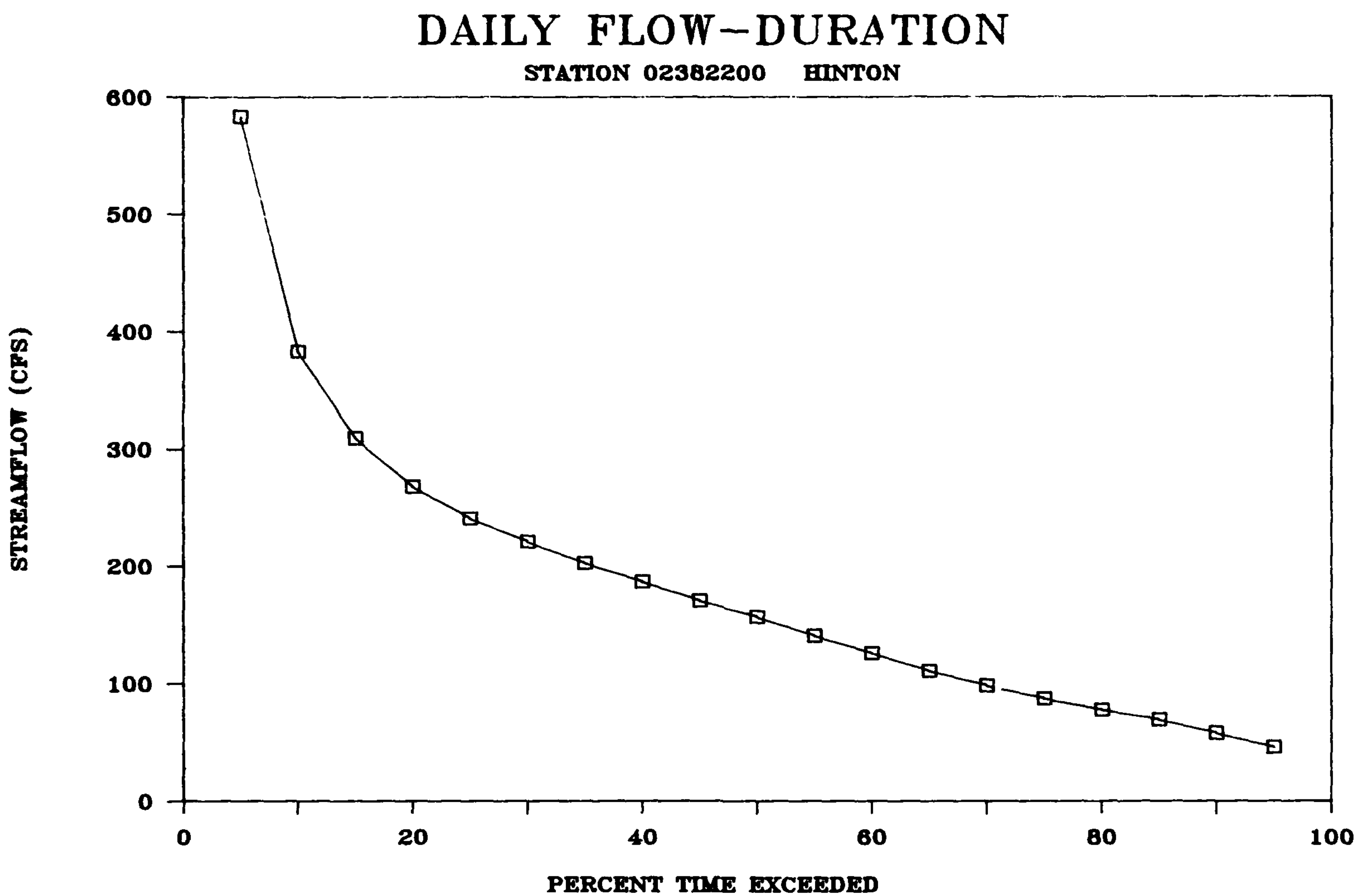

DAILY FLOW-DURATION
STATION 02382200 HINTON
STREAMFLOW (CFS)
600
500
400
300
200
100
0
0
20
40
60
80
100
PERCENT TIME EXCEEDED

FIGURE E-3

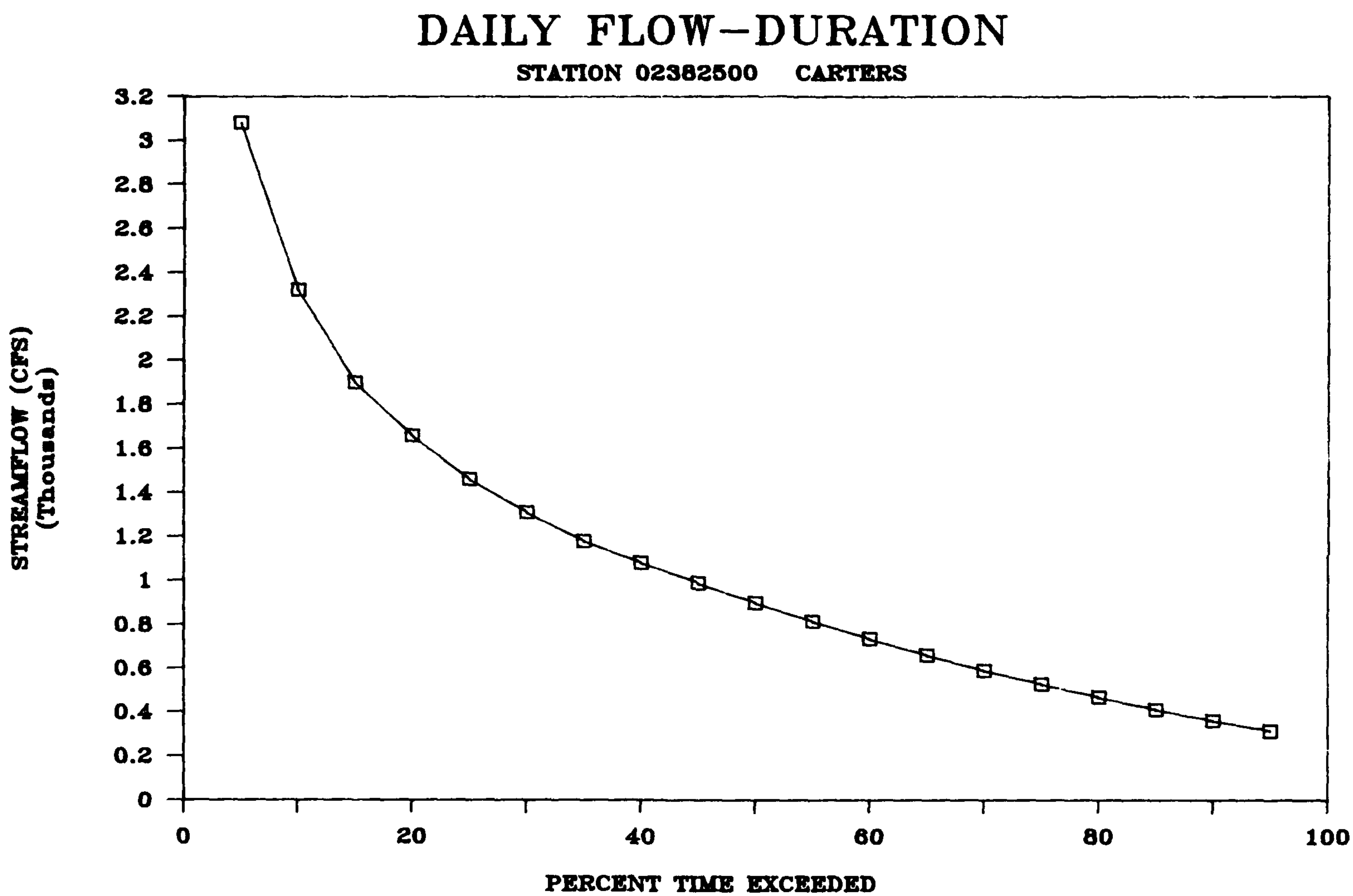

DAILY FLOW-DURATION
STATION 02382500 CARTERS
STREAMFLOW (CFS)
(Thousands)
3.2
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
20
40
60
80
100
PERCENT TIME EXCEEDED

FIGURE E-4

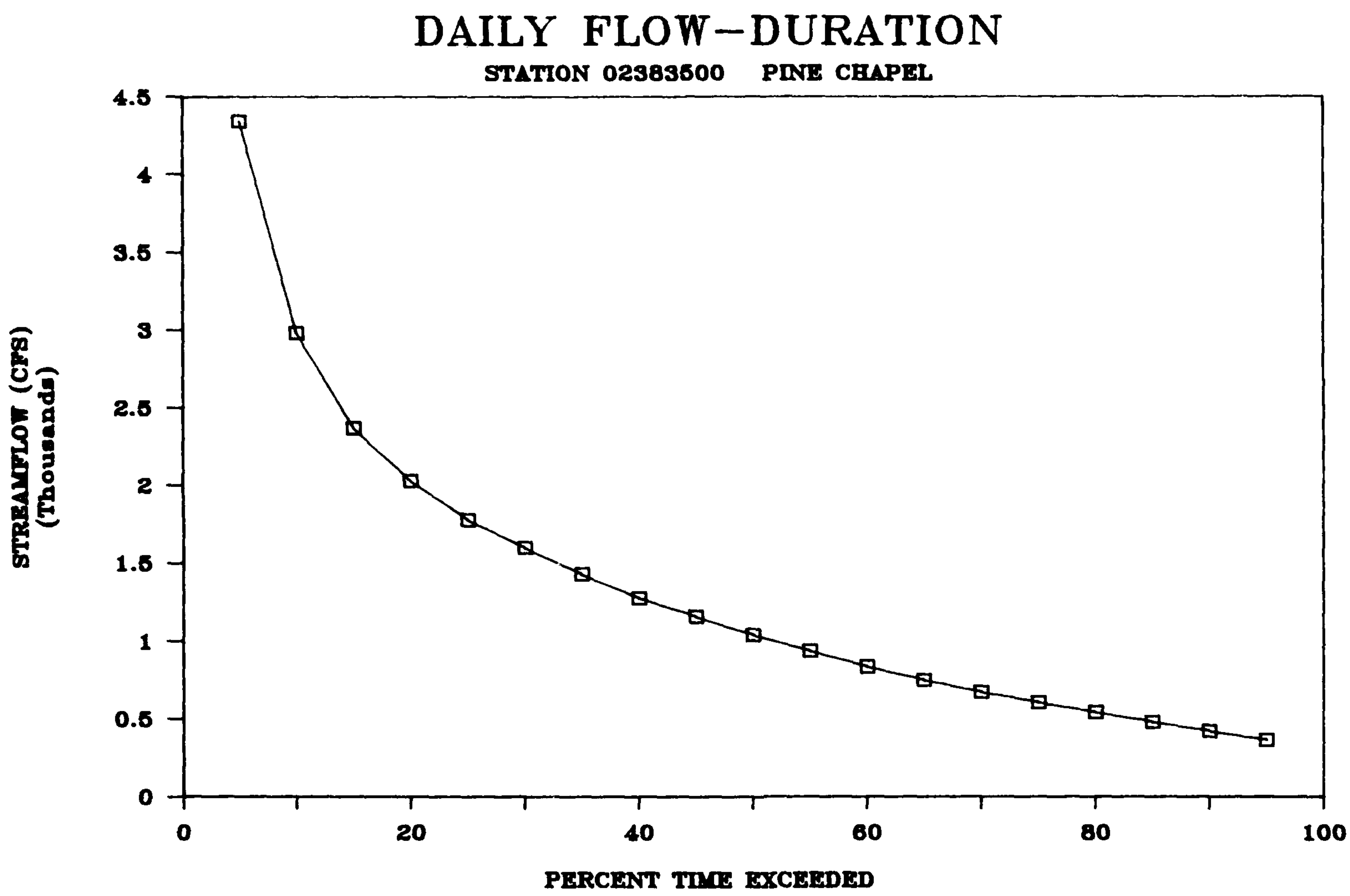

DAILY FLOW-DURATION
STATION 02383500 PINE CHAPEL
STREAMFLOW (CFS)
(Thousands)
PERCENT TIME EXCEEDED
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
20
40
60
80
100

FIGURE E-5

DAILY FLOW–DURATION

STATION 02384500 ETON

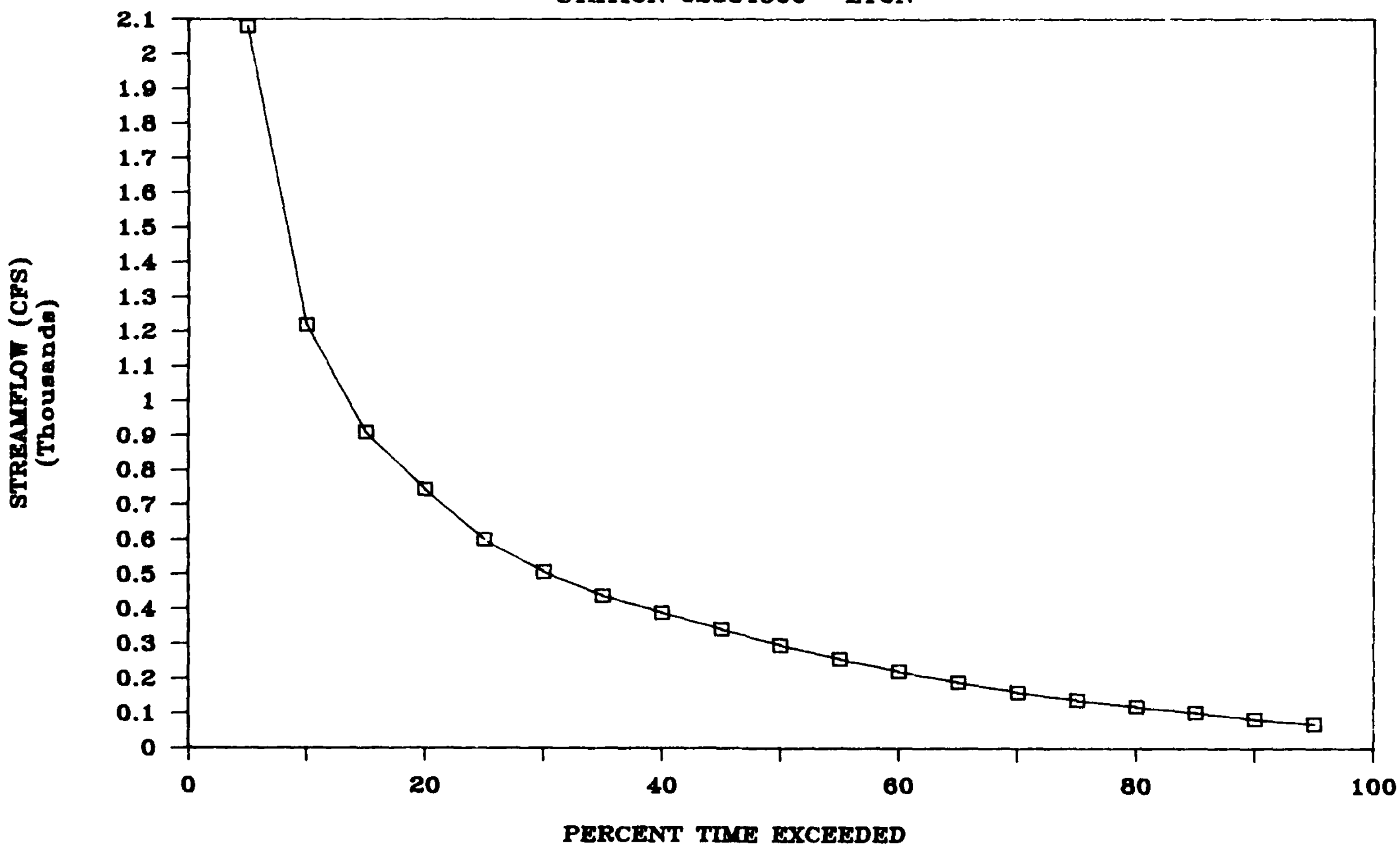


FIGURE E-6

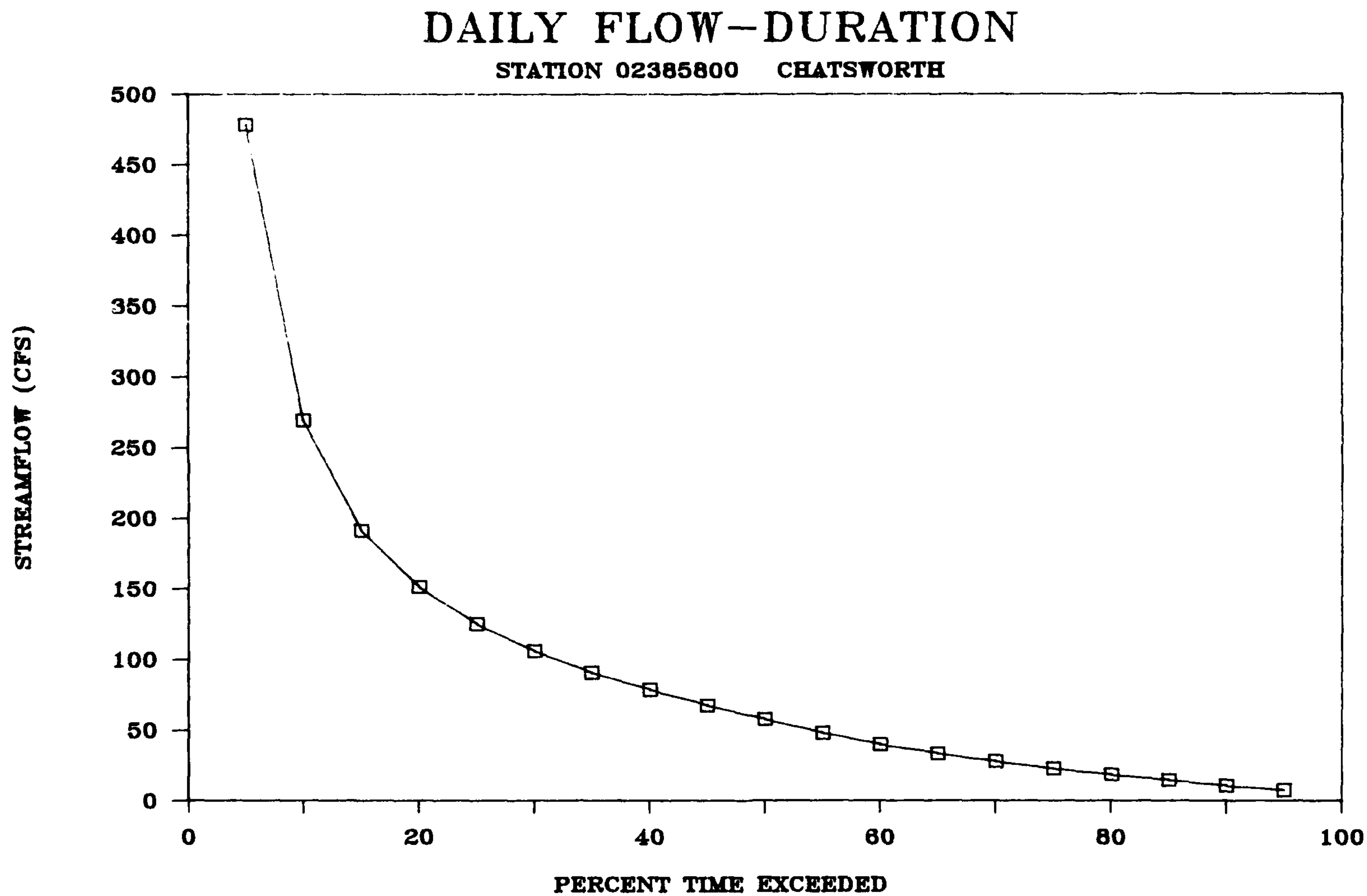

DAILY FLOW-DURATION
STATION 02385800 CHATSWORTH
STREAMFLOW (CFS)
500
450
400
350
300
250
200
150
100
50
0
0
20
40
60
80
100
PERCENT TIME EXCEEDED

FIGURE E-7

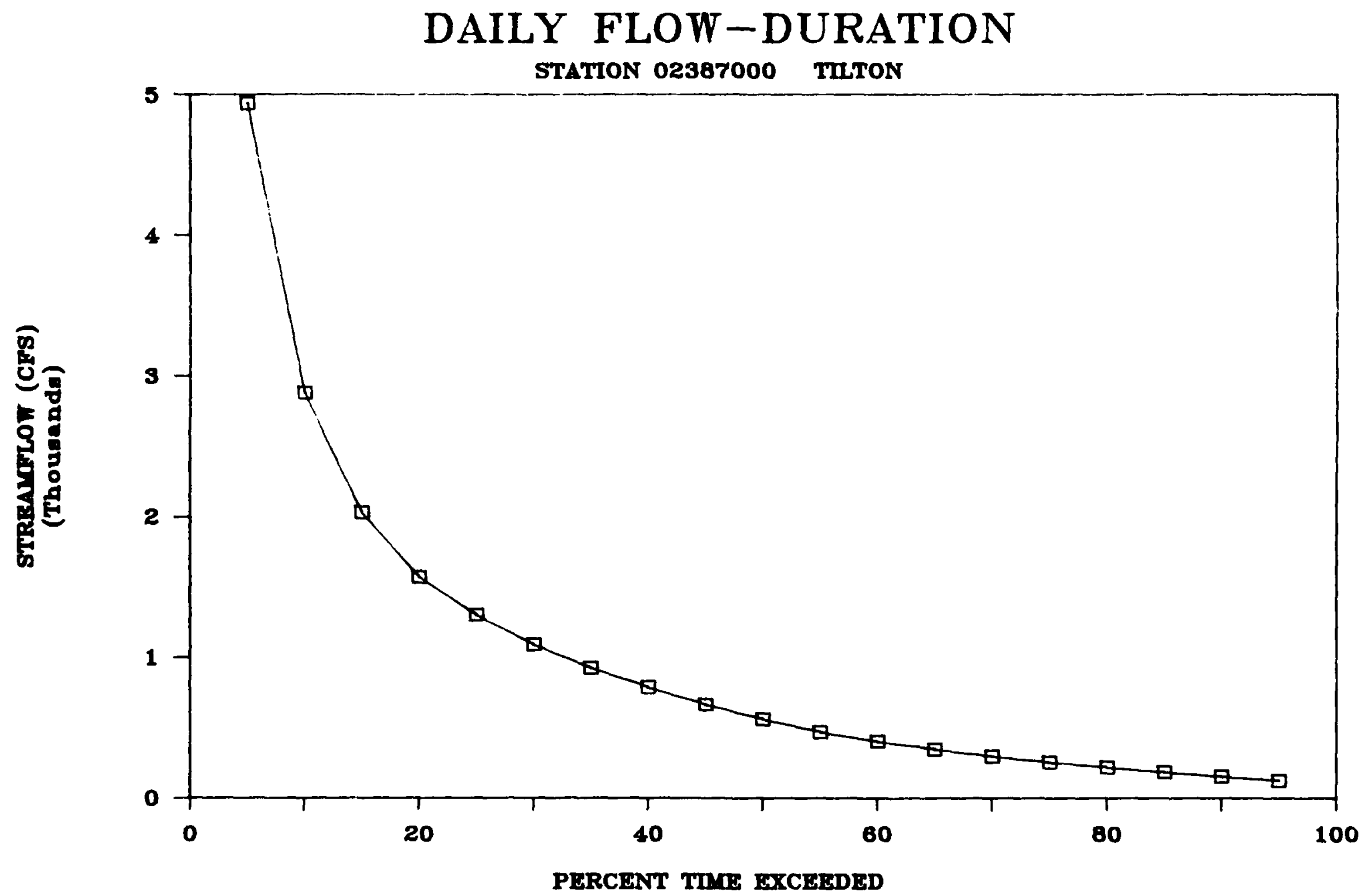

DAILY FLOW–DURATION
STATION 02387000 TILTON
STREAMFLOW (CFS)
(Thousands)
PERCENT TIME EXCEEDED
0
1
2
3
4
5
0
20
40
60
80
100

FIGURE E-8

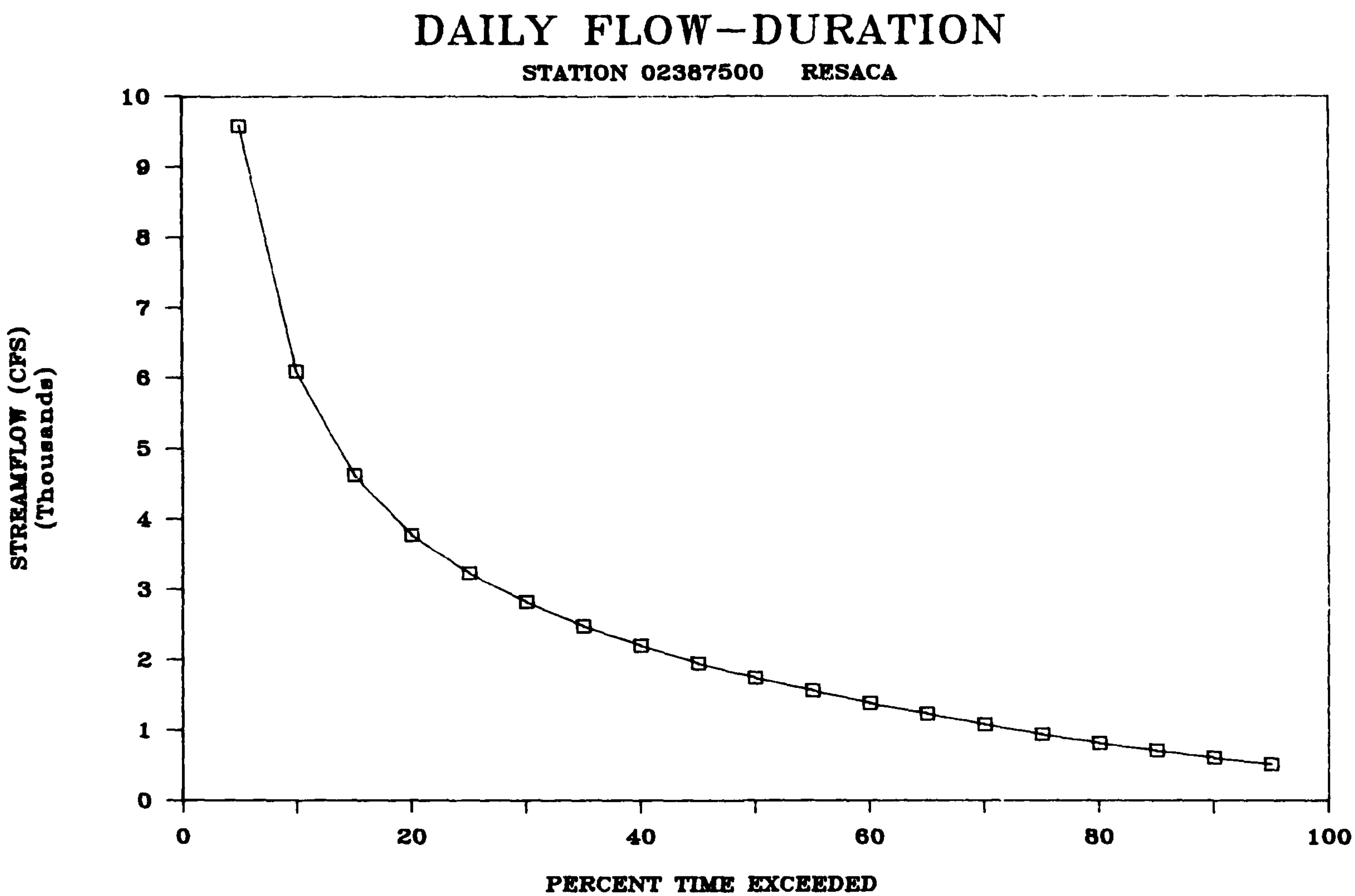

DAILY FLOW-DURATION
STATION 02387500 RESACA
STREAMFLOW (CFS)
(Thousands)
10
9
8
7
6
5
4
3
2
1
0
0
20
40
60
80
100
PERCENT TIME EXCEEDED

FIGURE E-9

DAILY FLOW-DURATION

STATION 02388300   ROME

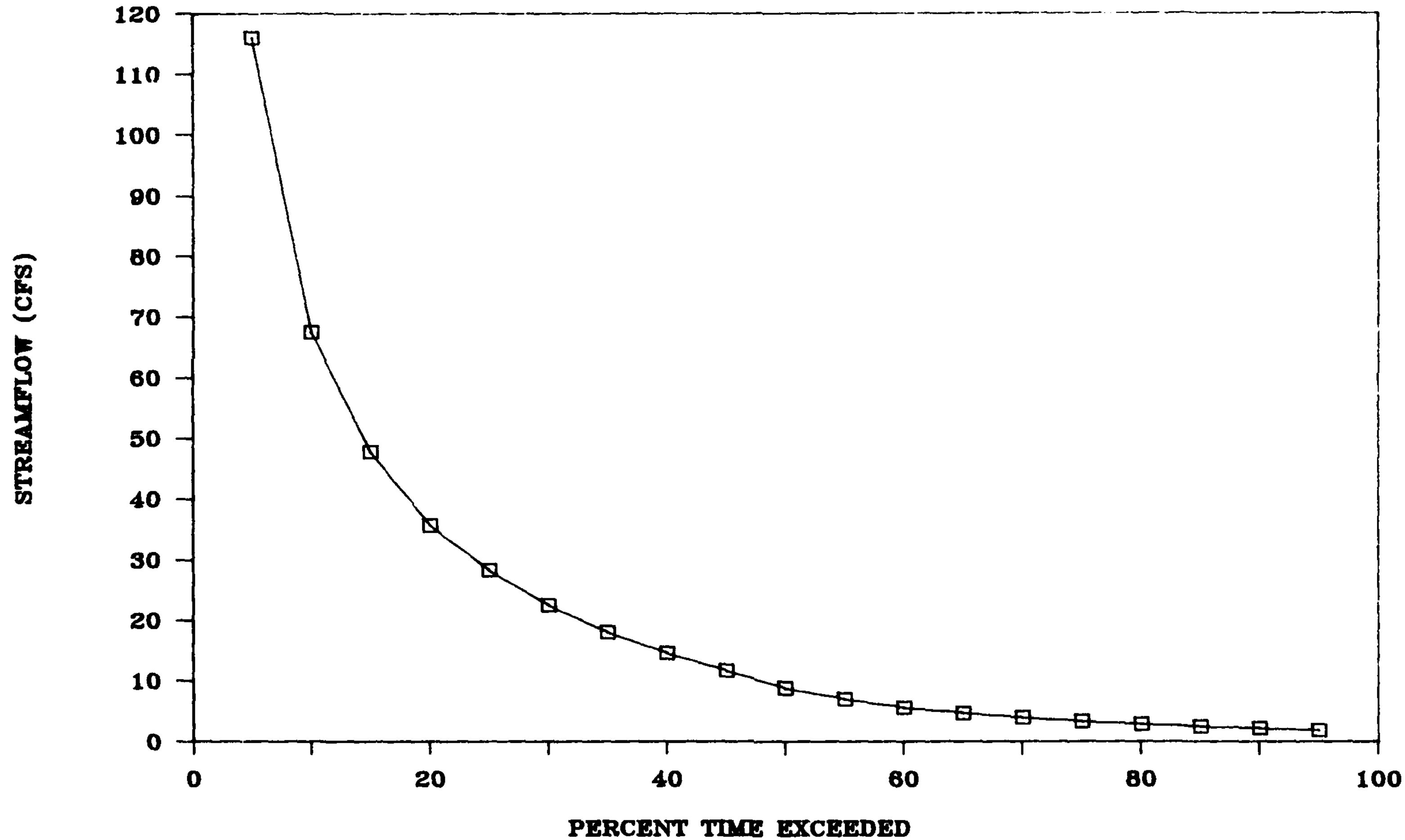


FIGURE E-10

DAILY FLOW–DURATION

STATION 02388320 ARMUCHEE

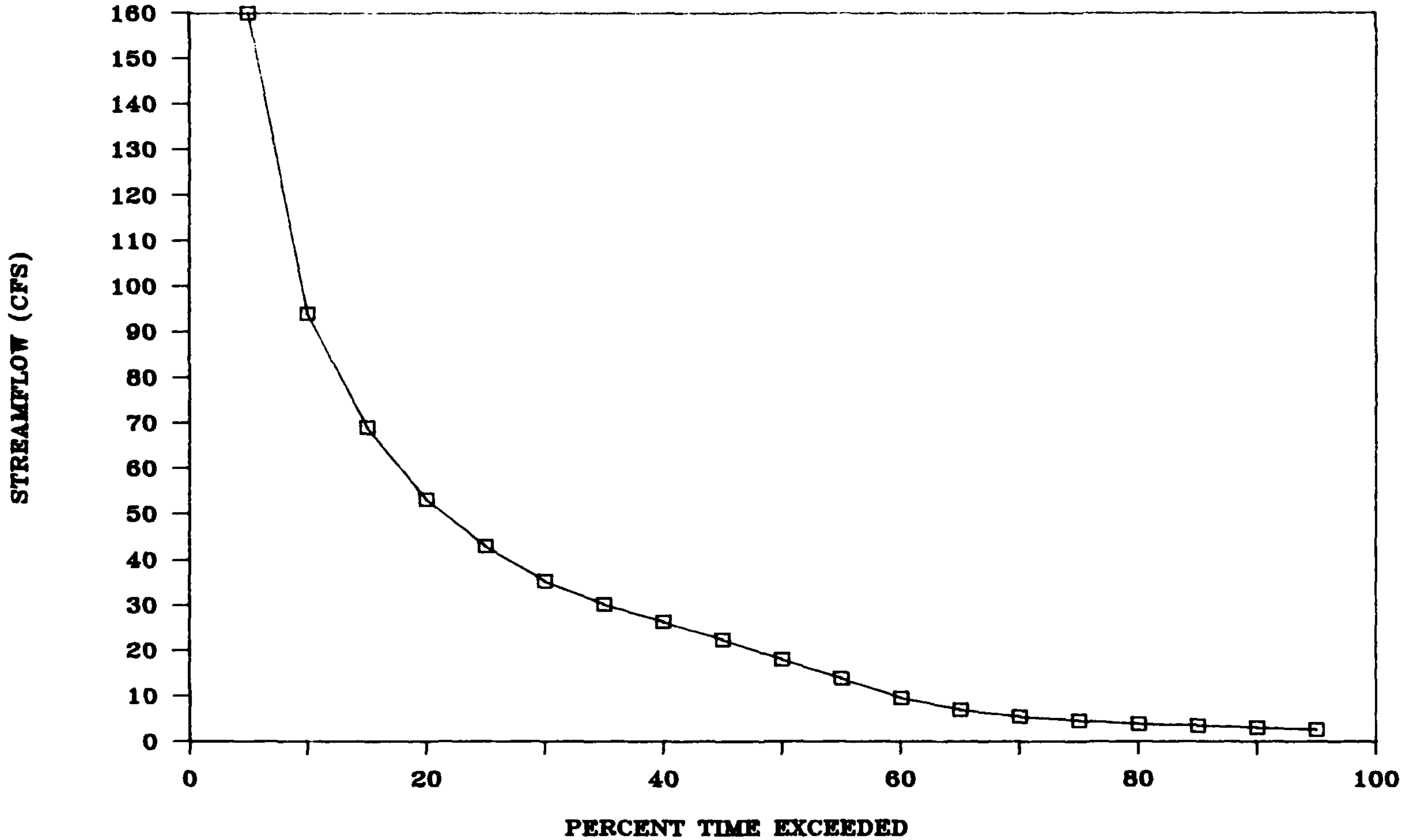


FIGURE E-11

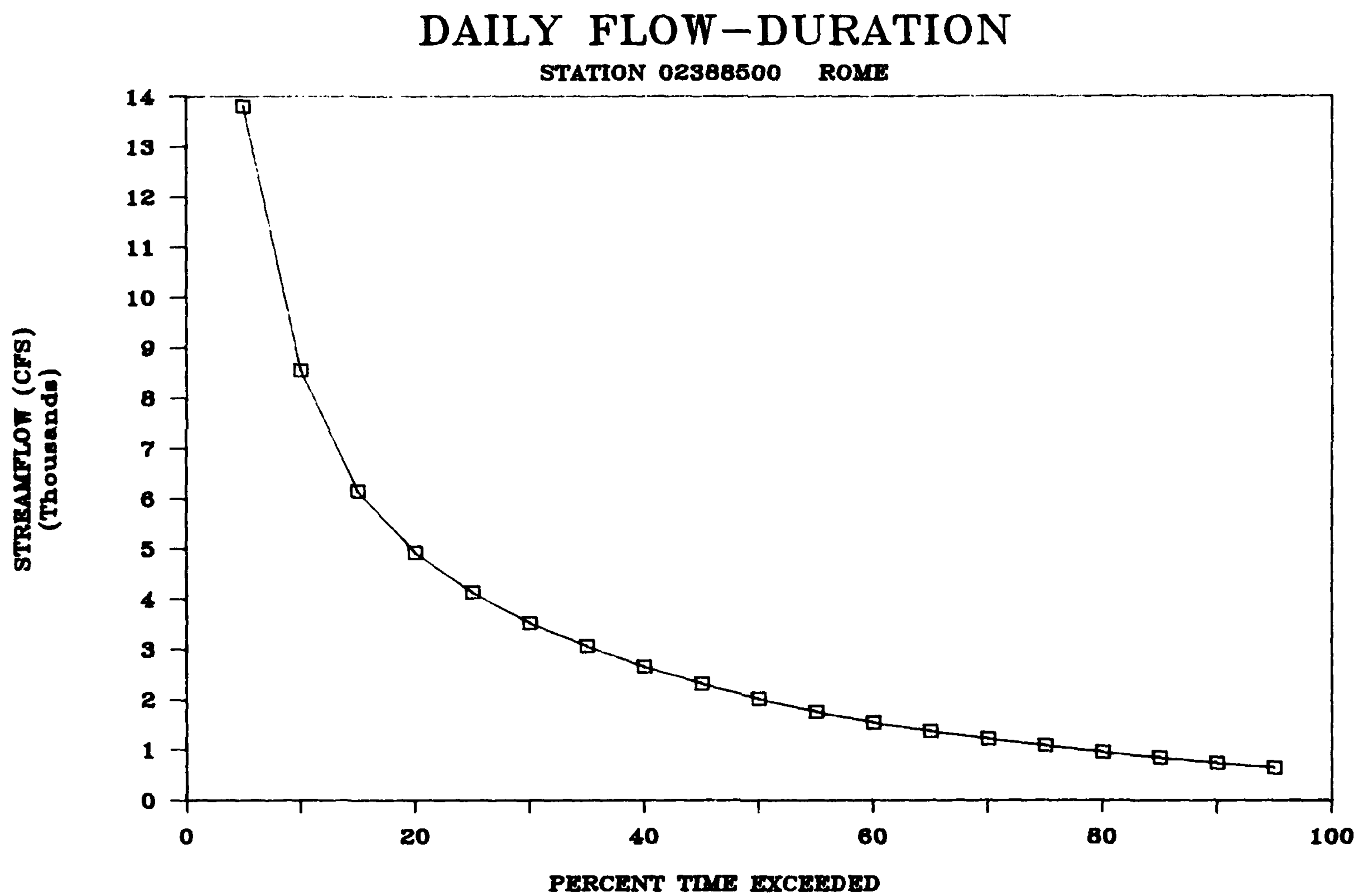

DAILY FLOW–DURATION
STATION 02388500 ROME
STREAMFLOW (CFS)
(Thousands)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
0
20
40
60
80
100
PERCENT TIME EXCEEDED

FIGURE E-12

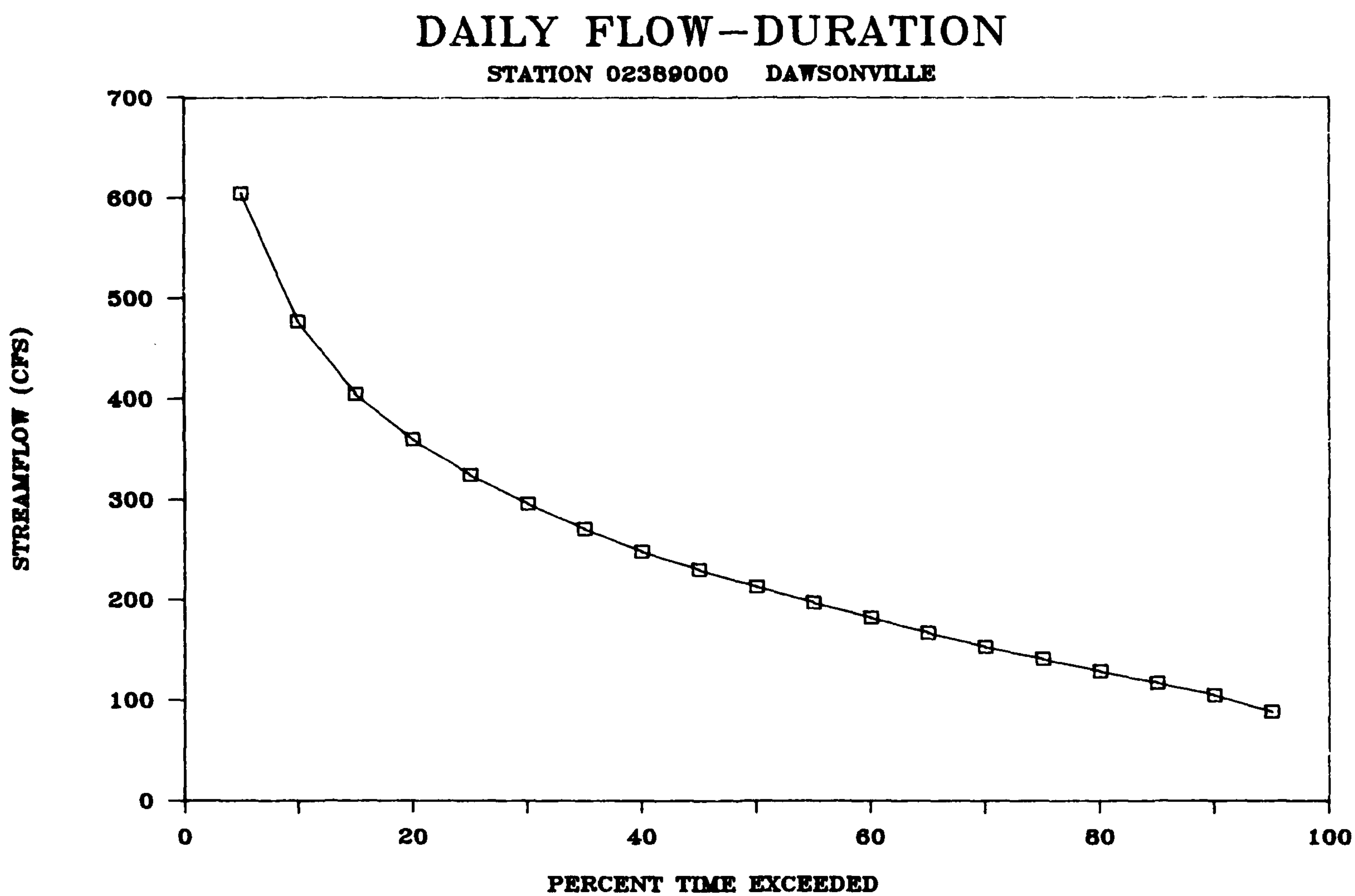

DAILY FLOW—DURATION
STATION 02389000 DAWSONVILLE
700
600
500
400
300
200
100
0
STREAMFLOW (CFS)
0
20
40
60
80
100
PERCENT TIME EXCEEDED

FIGURE E-13

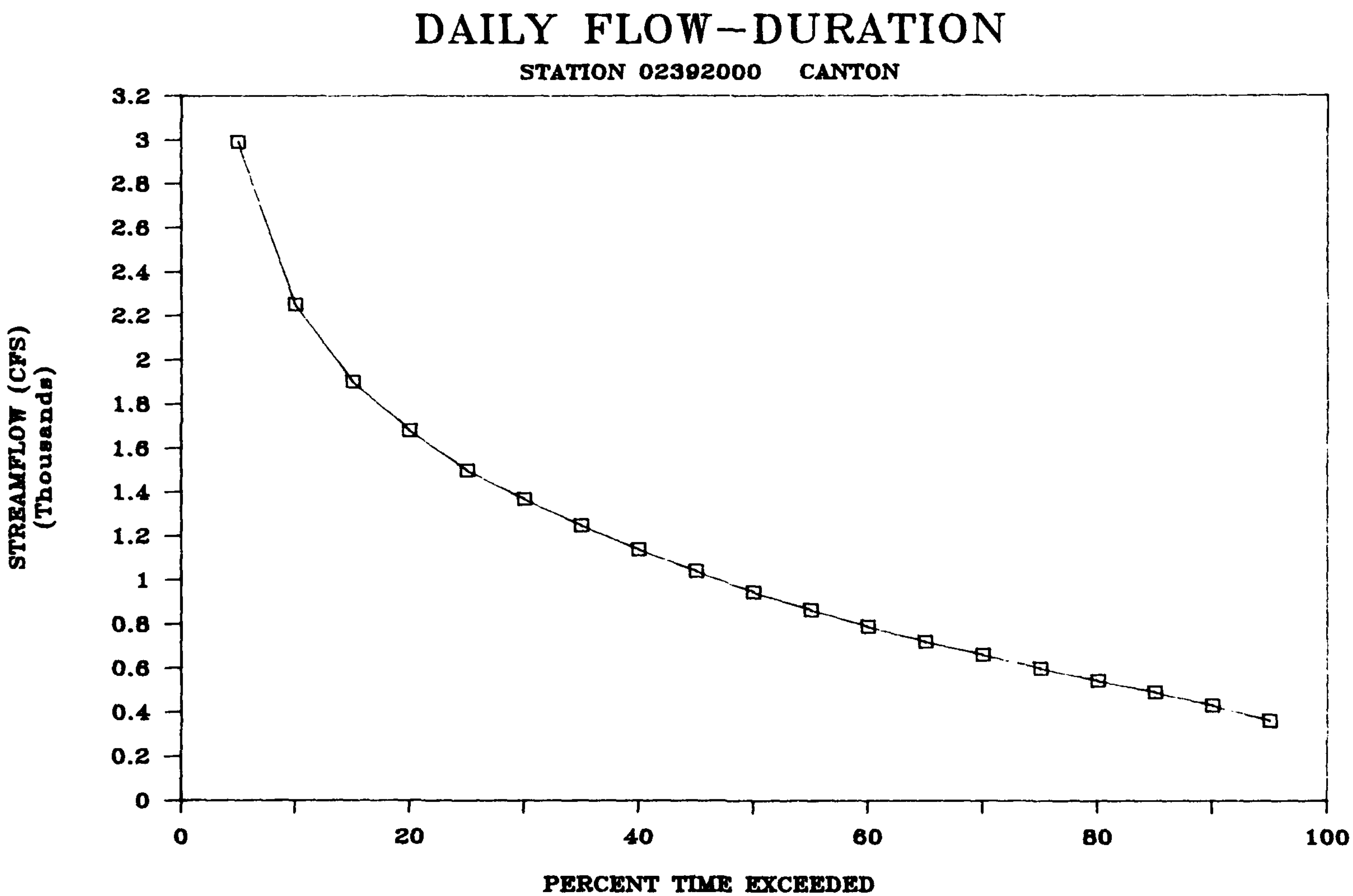

DAILY FLOW-DURATION
STATION 02392000 CANTON
STREAMFLOW (CFS)
(Thousands)
3.2
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
20
40
60
80
100
PERCENT TIME EXCEEDED

FIGURE E-14

DAILY FLOW-DURATION

STATION 02394000 CARTERSVILLE

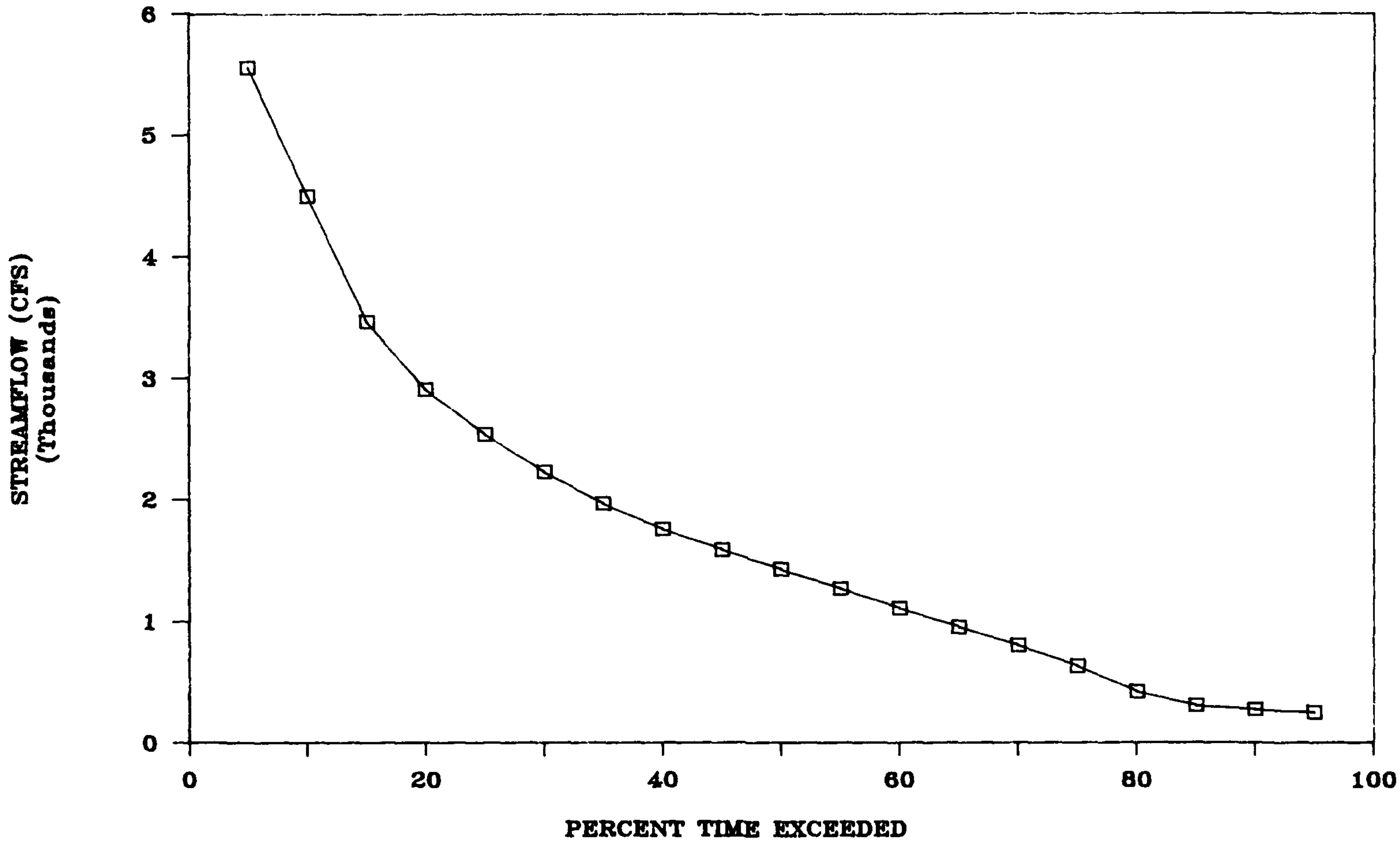


FIGURE E-15

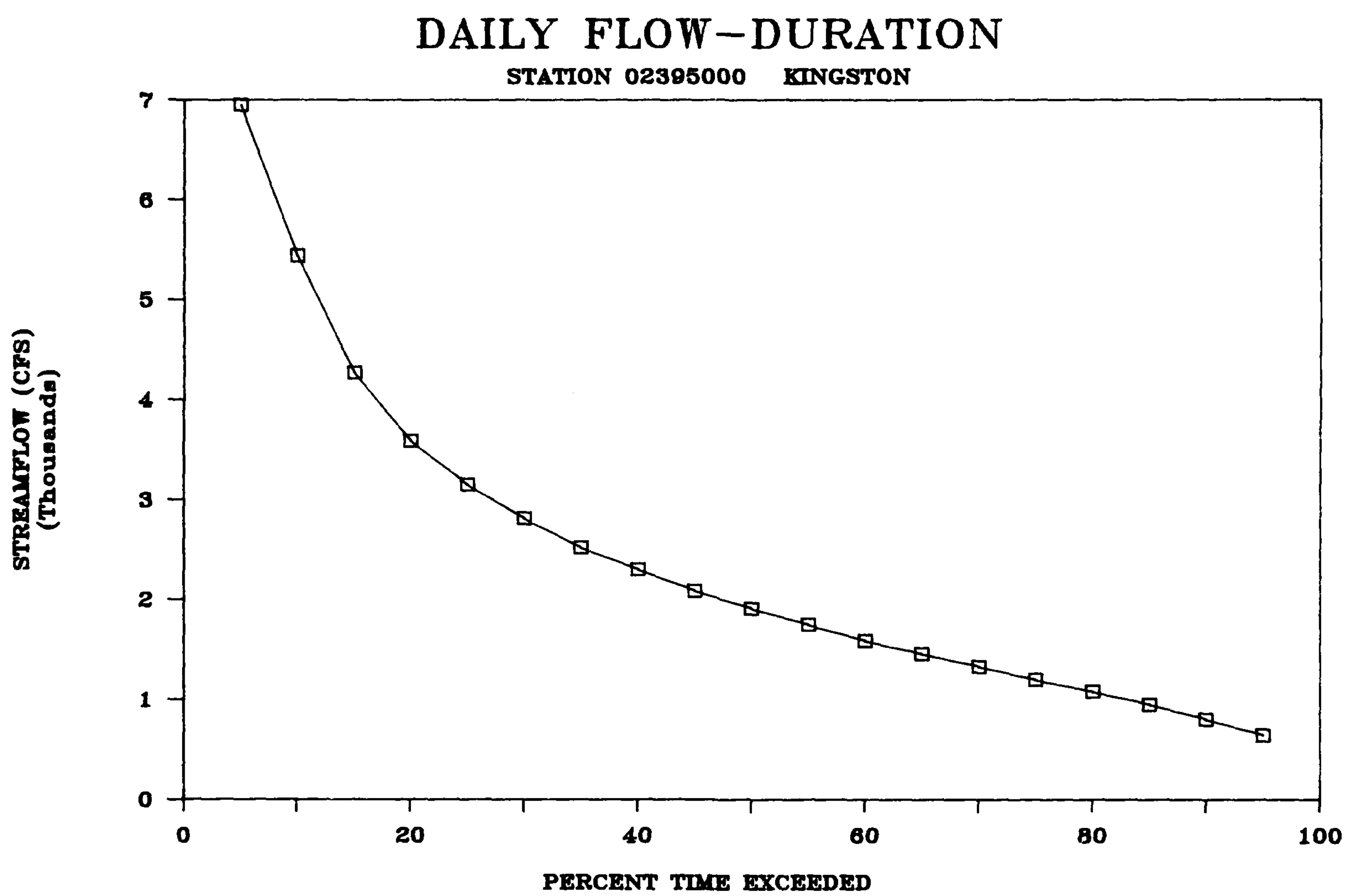

DAILY FLOW-DURATION
STATION 02395000 KINGSTON
STREAMFLOW (CFS)
(Thousands)
0
1
2
3
4
5
6
7
0
20
40
60
80
100
PERCENT TIME EXCEEDED

FIGURE E-16

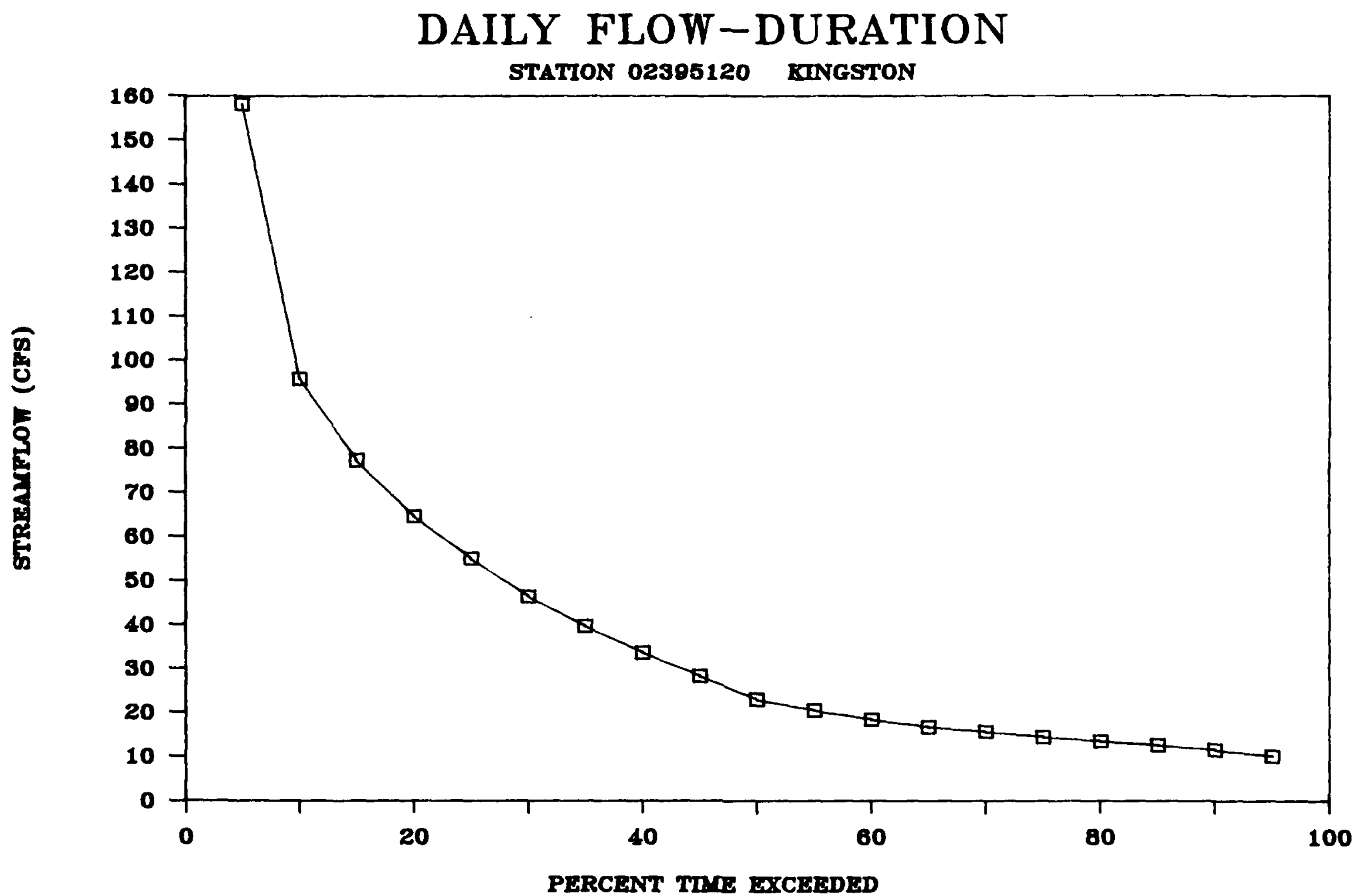

DAILY FLOW-DURATION
STATION 02395120 KINGSTON
STREAMFLOW (CFS)
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
0
20
40
60
80
100
PERCENT TIME EXCEEDED

FIGURE E-17

DAILY FLOW-DURATION

STATION 02396000 ROME

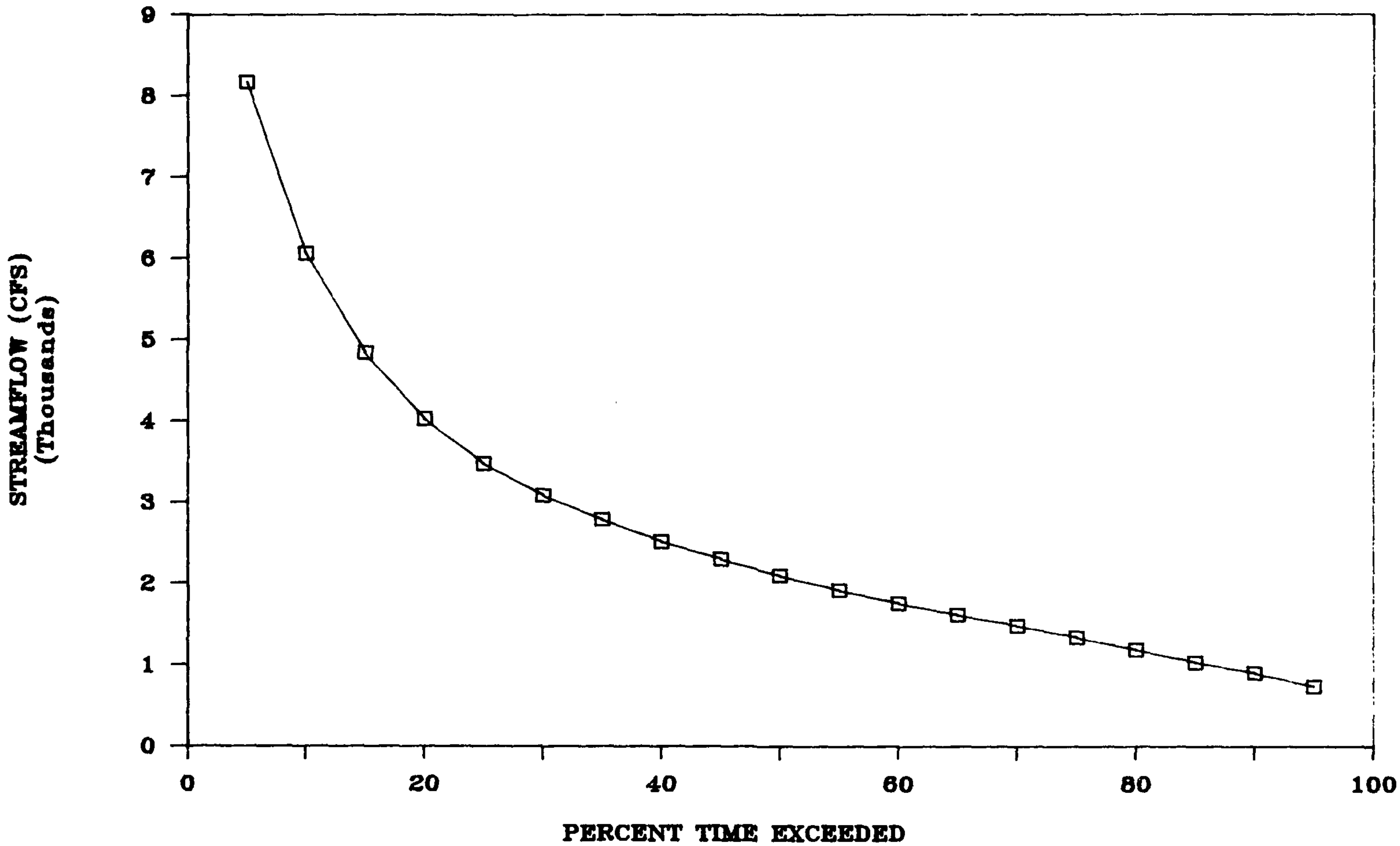
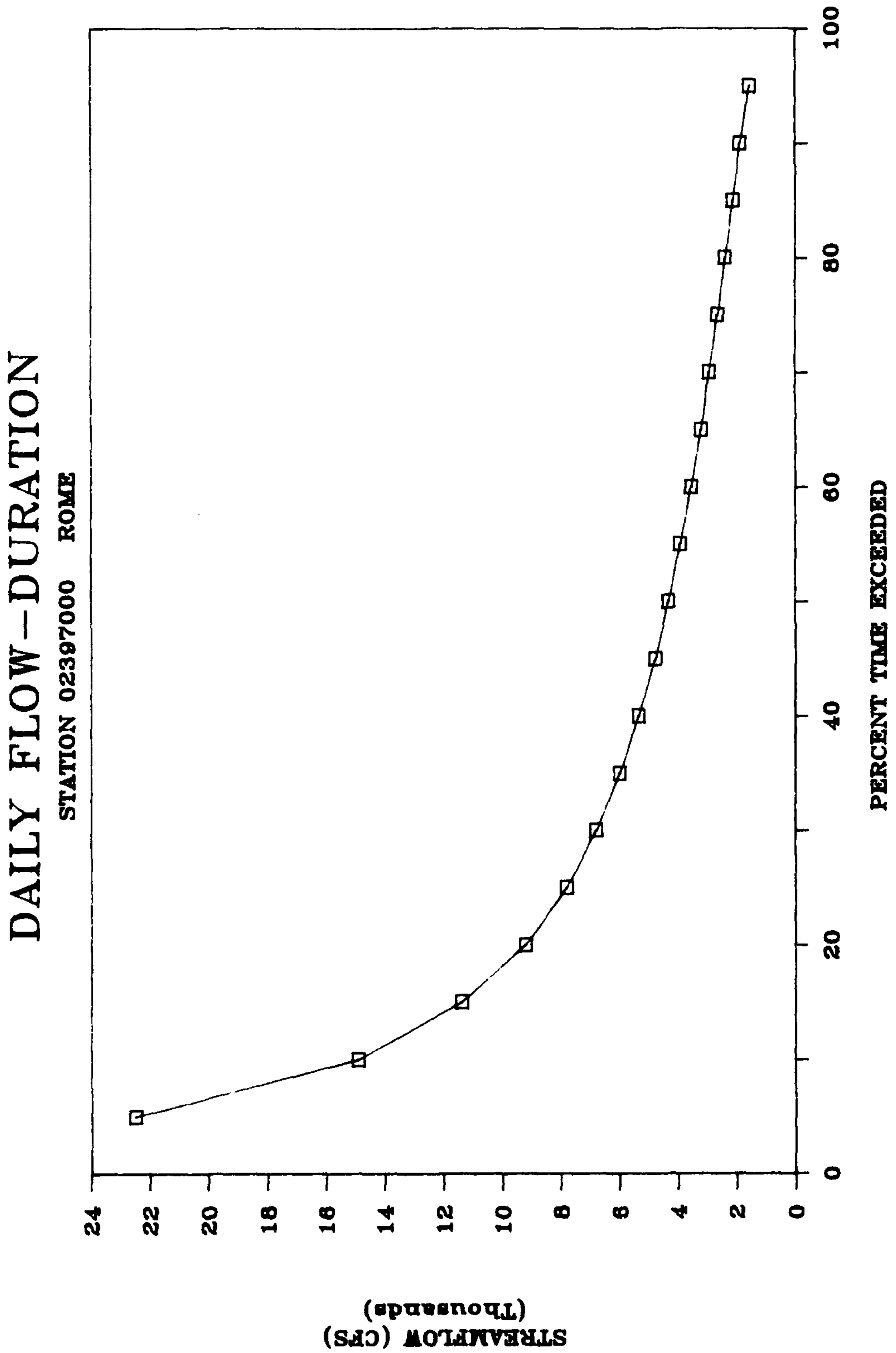


FIGURE E-18



DAILY FLOW–DURATION
STATION 02397000 ROME
STREAMFLOW (CFS)
(Thousands)
PERCENT TIME EXCEEDED
0
20
40
60
80
100
0
2
4
6
8
10
12
14
16
18
20
22
24

FIGURE E–19

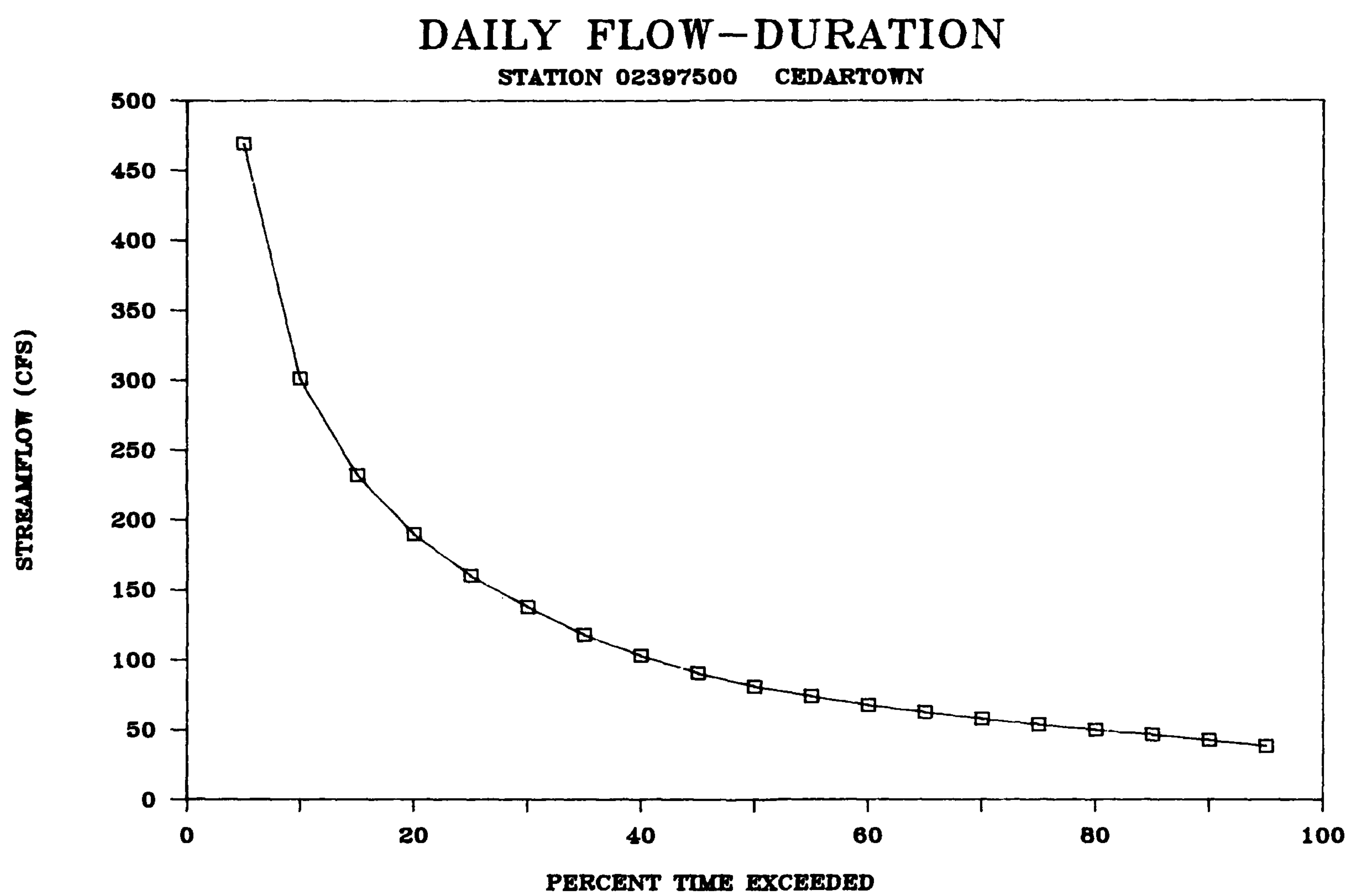
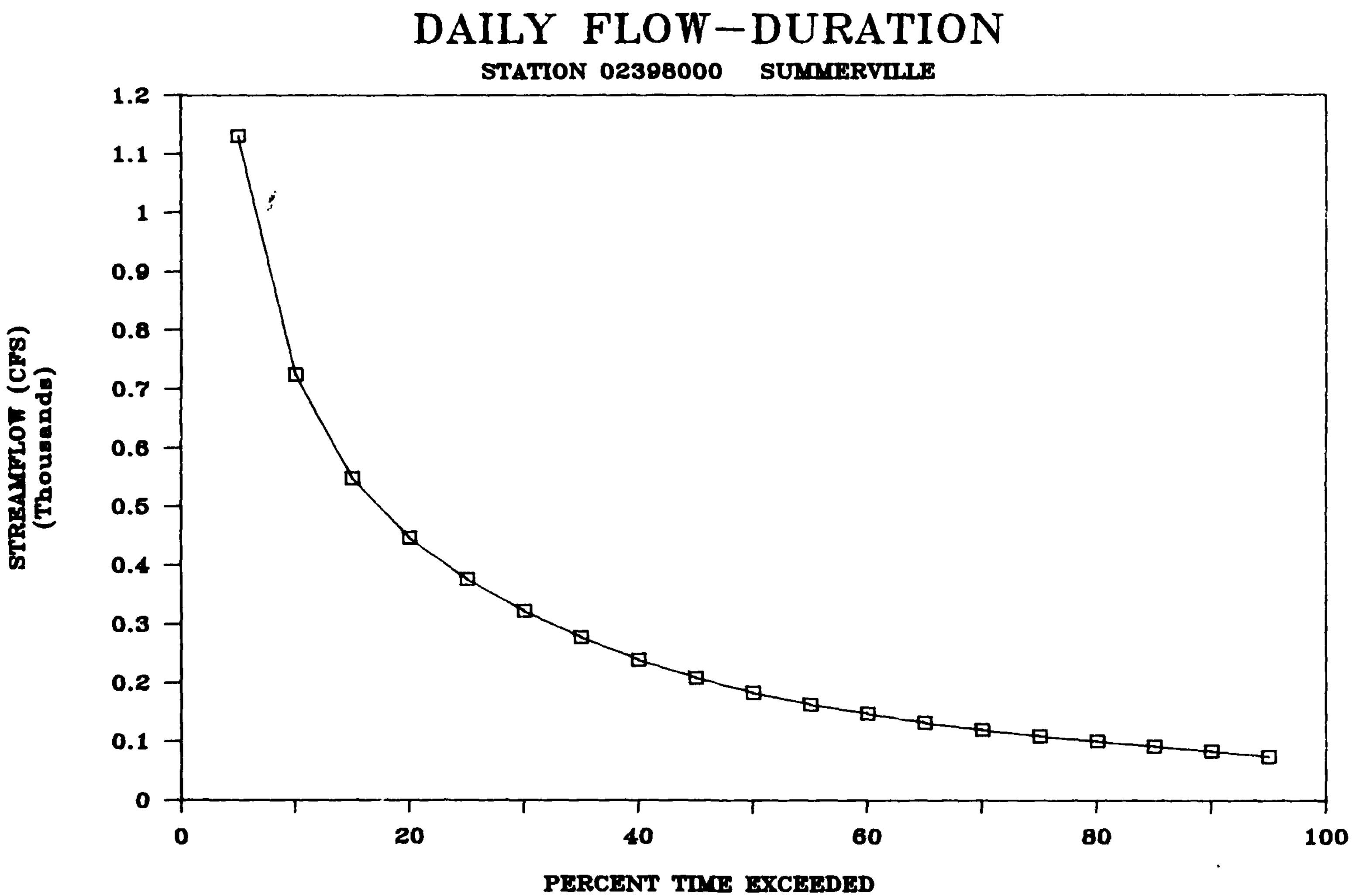

DAILY FLOW-DURATION
STATION 02397500 CEDARTOWN
STREAMFLOW (CFS)
PERCENT TIME EXCEEDED
0
50
100
150
200
250
300
350
400
450
500
0
20
40
60
80
100

FIGURE E-20



DAILY FLOW-DURATION
STATION 02398000 SUMMERVILLE
STREAMFLOW (CFS)
(Thousands)
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
20
40
60
80
100
PERCENT TIME EXCEEDED

FIGURE E-21

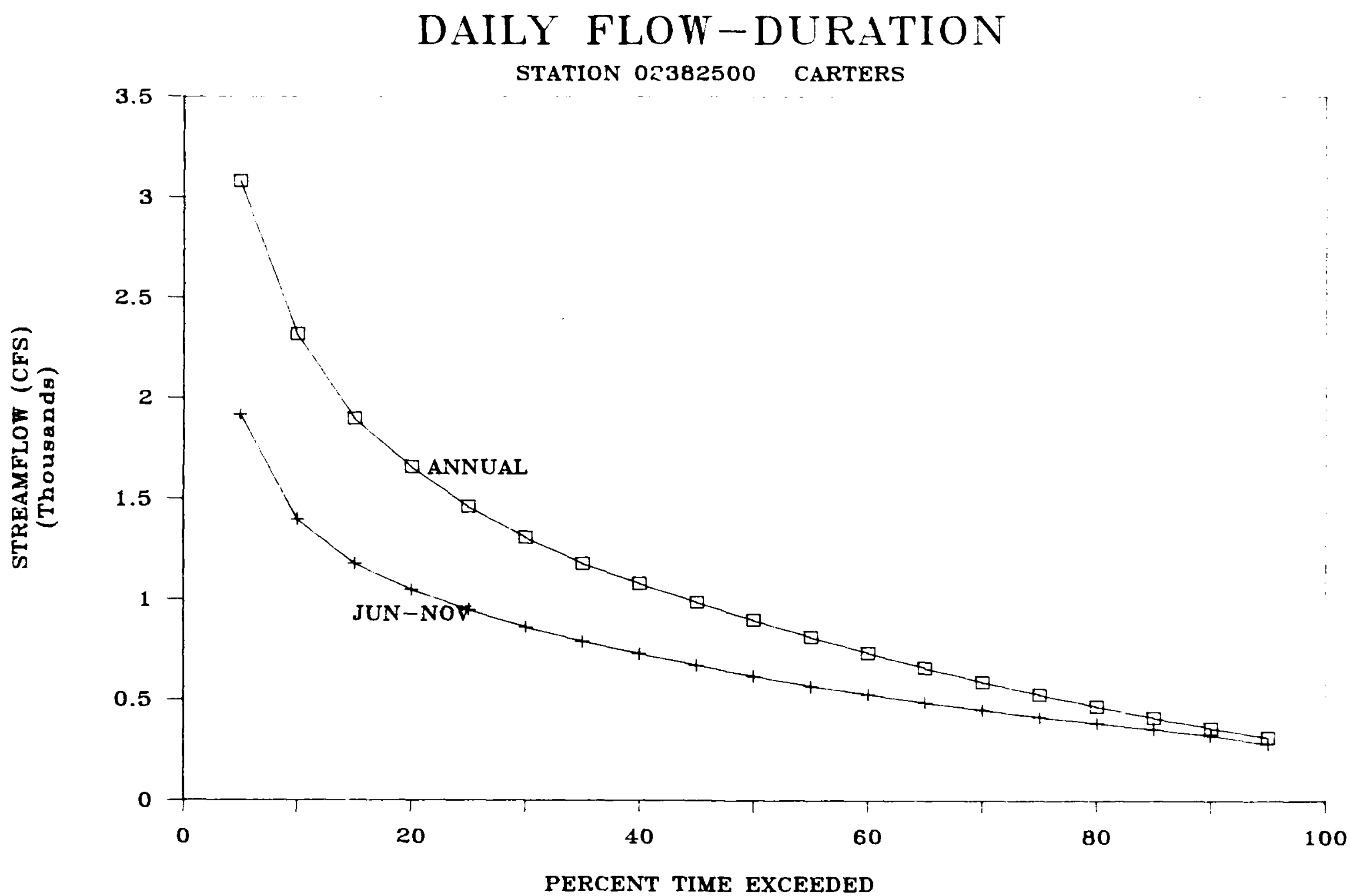
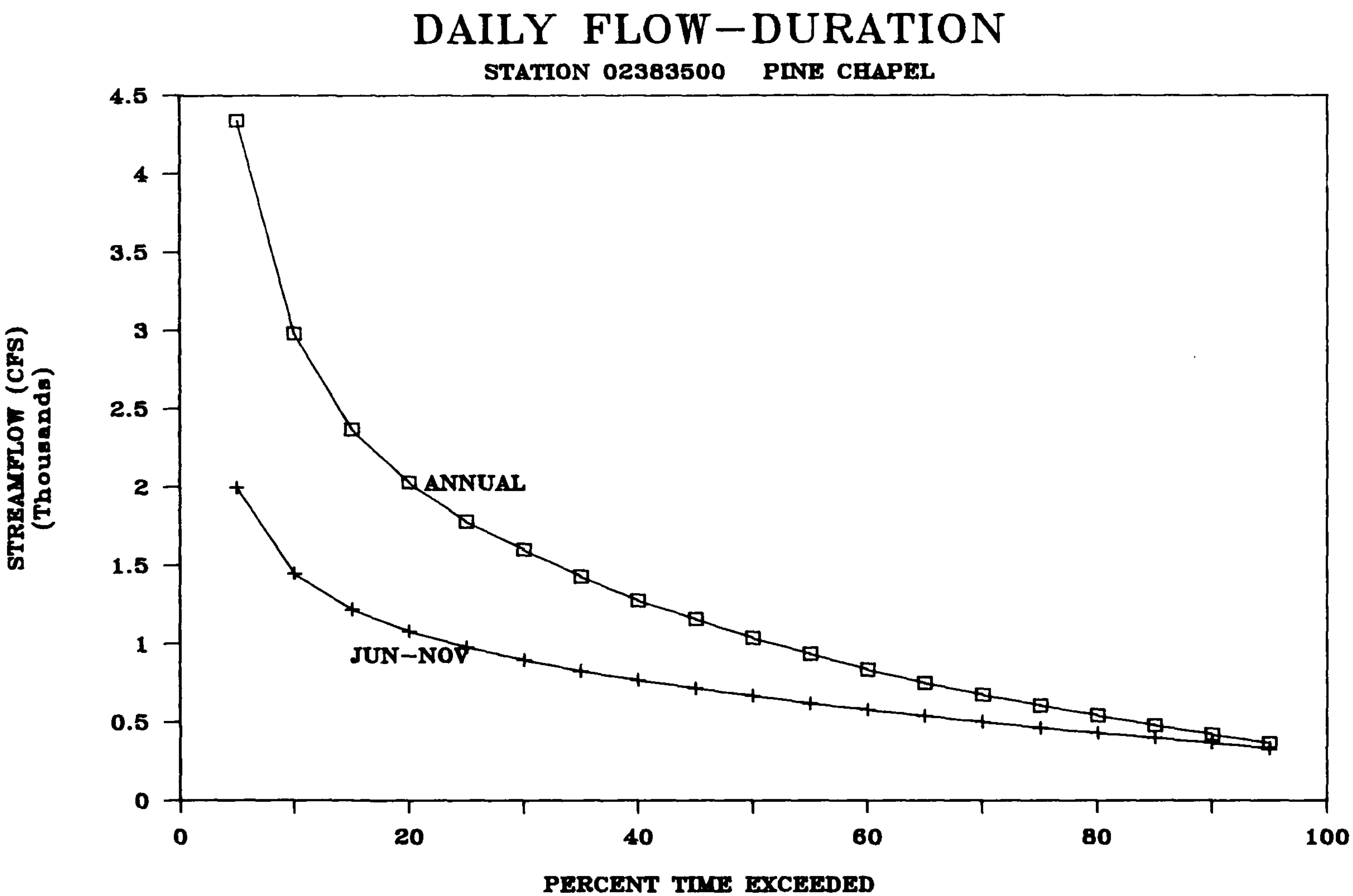

DAILY FLOW-DURATION
STATION 02382500 CARTERS
STREAMFLOW (CFS)
(Thousands)
3.5
3
2.5
2
1.5
1
0.5
0
0
20
40
60
80
100
PERCENT TIME EXCEEDED
ANNUAL
JUN-NOV

FIGURE E-22



DAILY FLOW-DURATION
STATION 02383500 PINE CHAPEL
STREAMFLOW (CFS)
(Thousands)
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
ANNUAL
JUN-NOV
0
20
40
60
80
100
PERCENT TIME EXCEEDED

FIGURE E-23

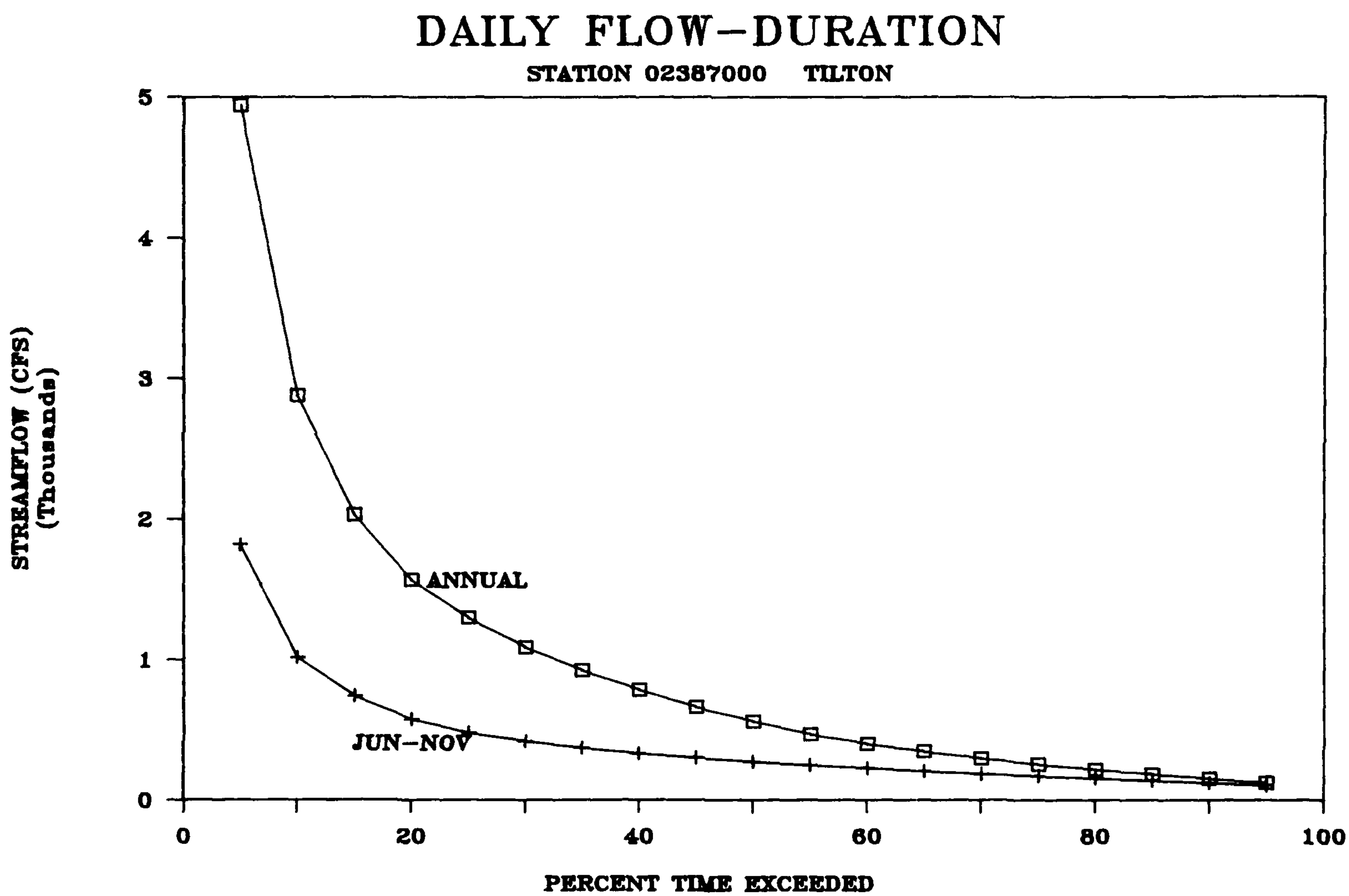

DAILY FLOW-DURATION
STATION 02387000 TILTON
STREAMFLOW (CFS)
(Thousands)
5
4
3
2
1
0
ANNUAL
JUN-NOV
0
20
40
60
80
100
PERCENT TIME EXCEEDED

FIGURE E-24

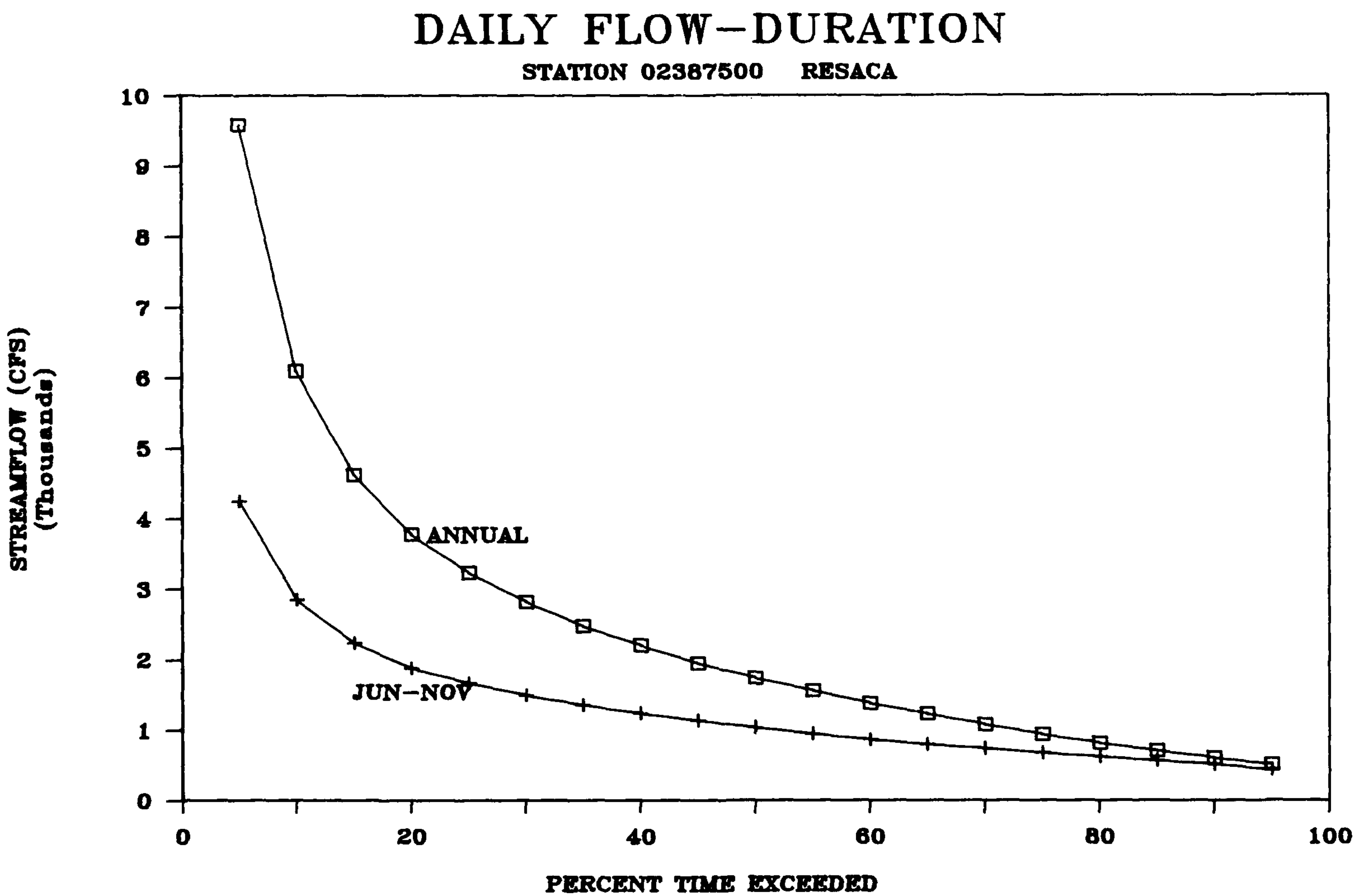
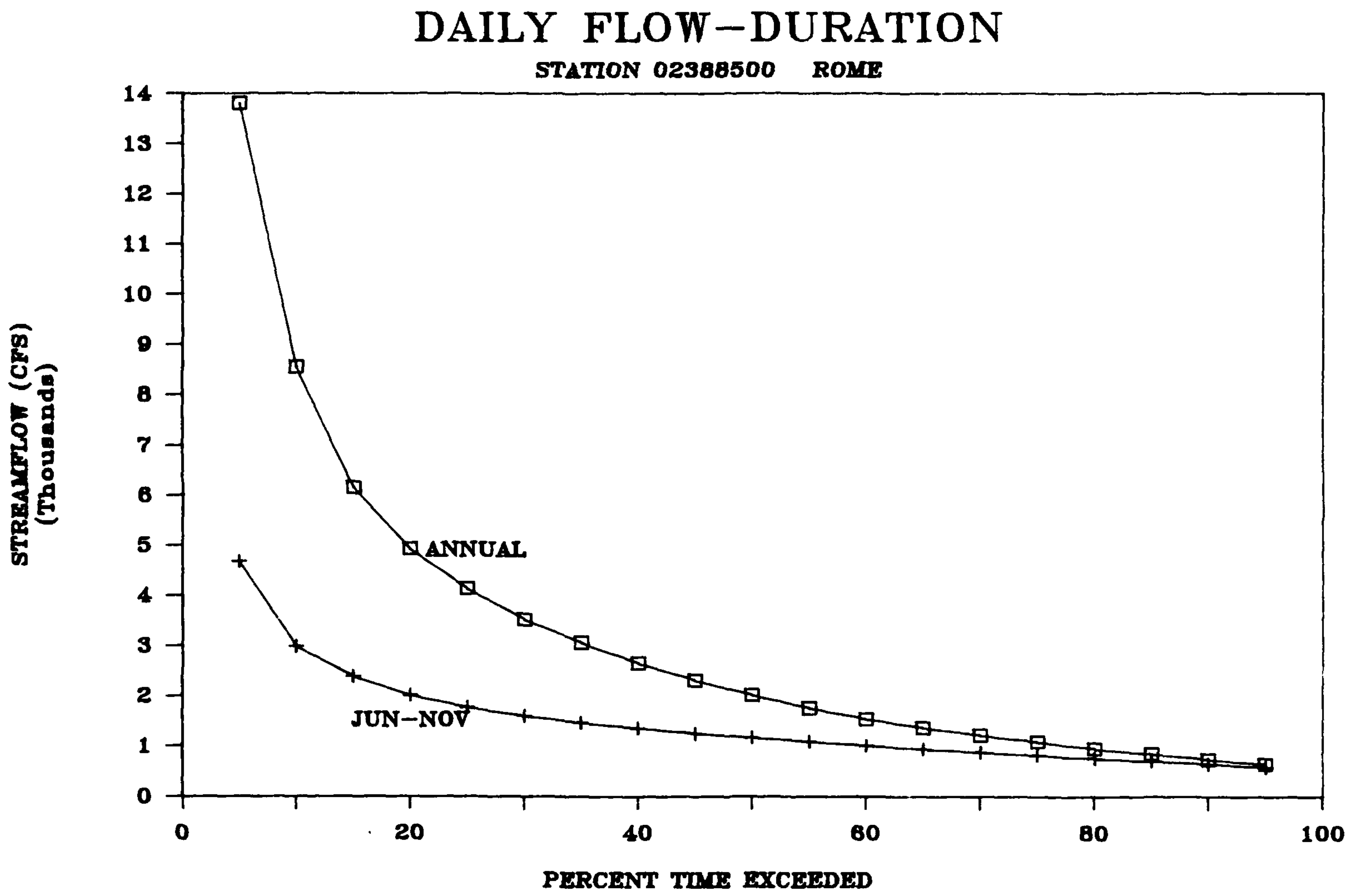

DAILY FLOW–DURATION
STATION 02387500 RESACA
STREAMFLOW (CFS)
(Thousands)
ANNUAL
JUN–NOV
PERCENT TIME EXCEEDED
0
1
2
3
4
5
6
7
8
9
10
0
20
40
60
80
100

FIGURE E-25



DAILY FLOW-DURATION
STATION 02388500 ROME
STREAMFLOW (CFS)
(Thousands)
PERCENT TIME EXCEEDED
ANNUAL
JUN-NOV
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
0
20
40
60
80
100

FIGURE E-26

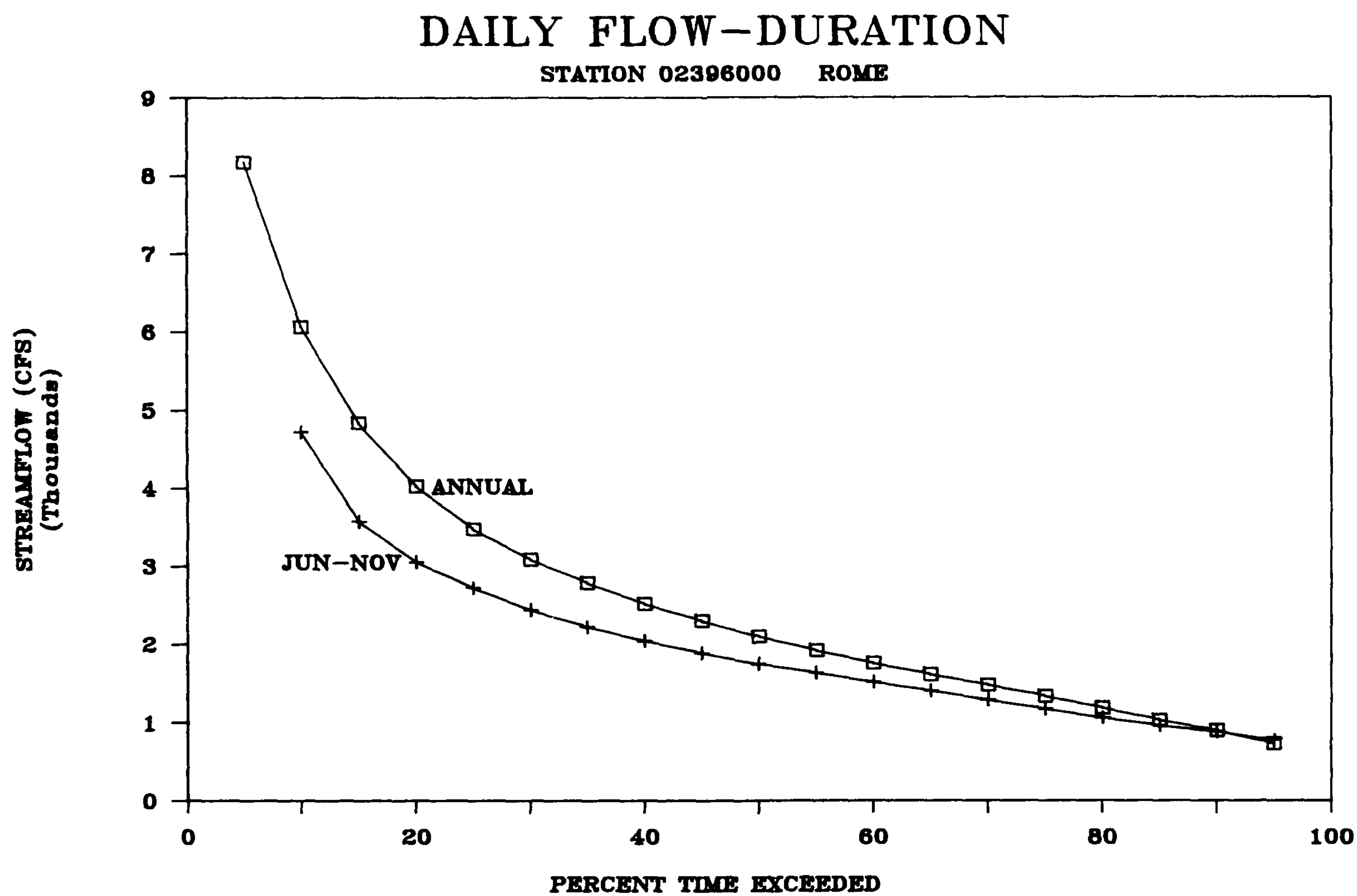
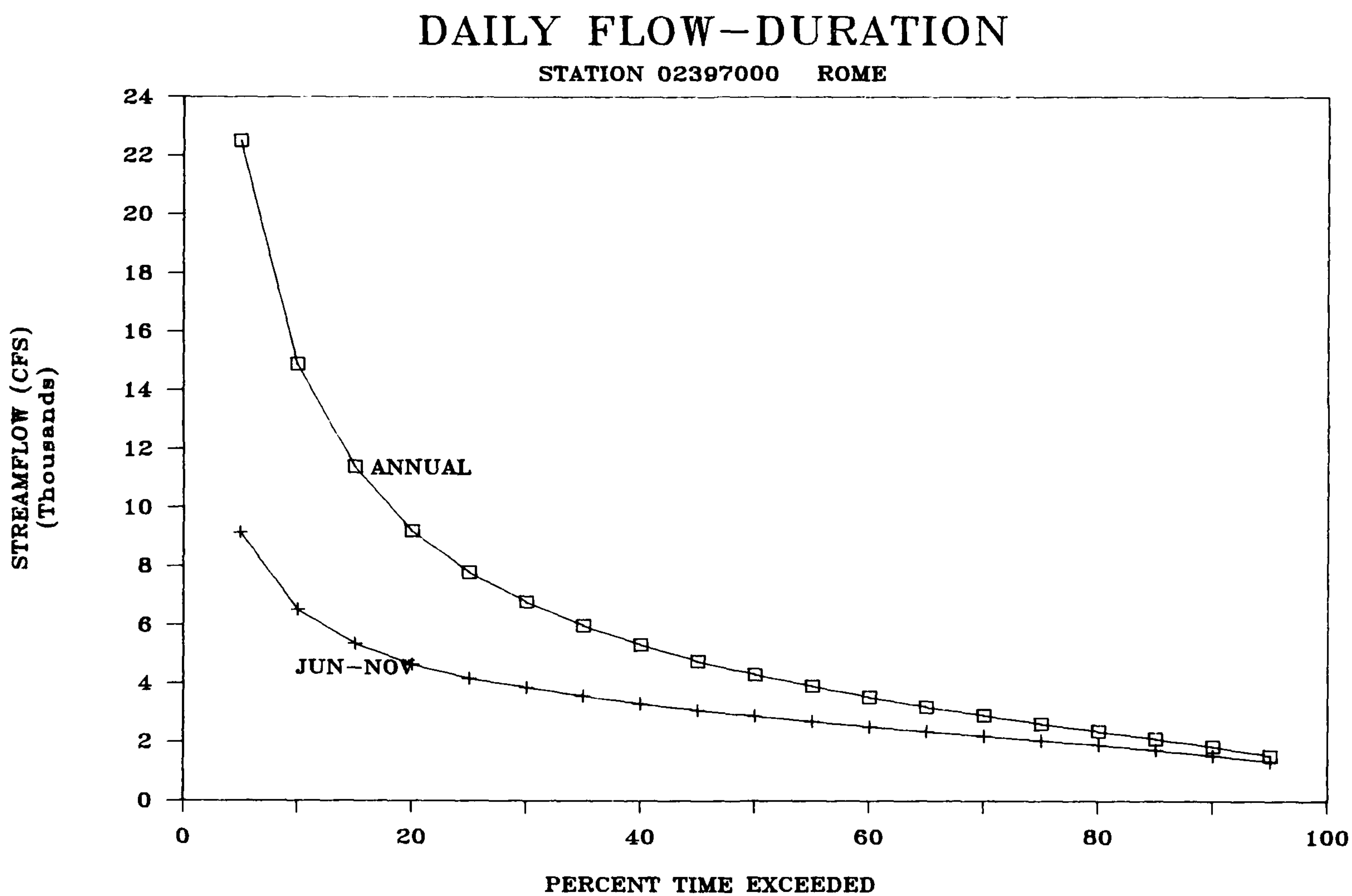

DAILY FLOW-DURATION
STATION 02396000 ROME
STREAMFLOW (CFS)
(Thousands)
ANNUAL
JUN-NOV
PERCENT TIME EXCEEDED
0
1
2
3
4
5
6
7
8
9
0
20
40
60
80
100

FIGURE E-27



DAILY FLOW-DURATION
STATION 02397000 ROME
STREAMFLOW (CFS)
(Thousands)
0
2
4
6
8
10
12
14
16
18
20
22
24
ANNUAL
JUN-NOV
0
20
40
60
80
100
PERCENT TIME EXCEEDED

FIGURE E-28

APPENDIX F

WET AND DRY YEAR GRAPHS

APPENDIX F

WET AND DRY YEAR GRAPHS

Contents

LOW-FLOW MONTHS, JUNE - NOVEMBER

F-22	02382500	Carters	F-22
F-23	02383500	Pine Chapel	F-23
F-24	02387000	Tilton	F-24
F-25	02387500	Resaca	F-25
F-26	02388500	Rome	F-26
F-27	02386000	Rome	F-27
F-28	02397000	Rome	F-28

AVERAGE MONTHLY FLOWS

F-29	02382500	Carters	F-29
F-30	02383500	Pine Chapel	F-30
F-31	02387000	Tilton	F-31
F-32	02387500	Resaca	F-32
F-33	02388500	Rome	F-33
F-34	02396000	Rome	F-34

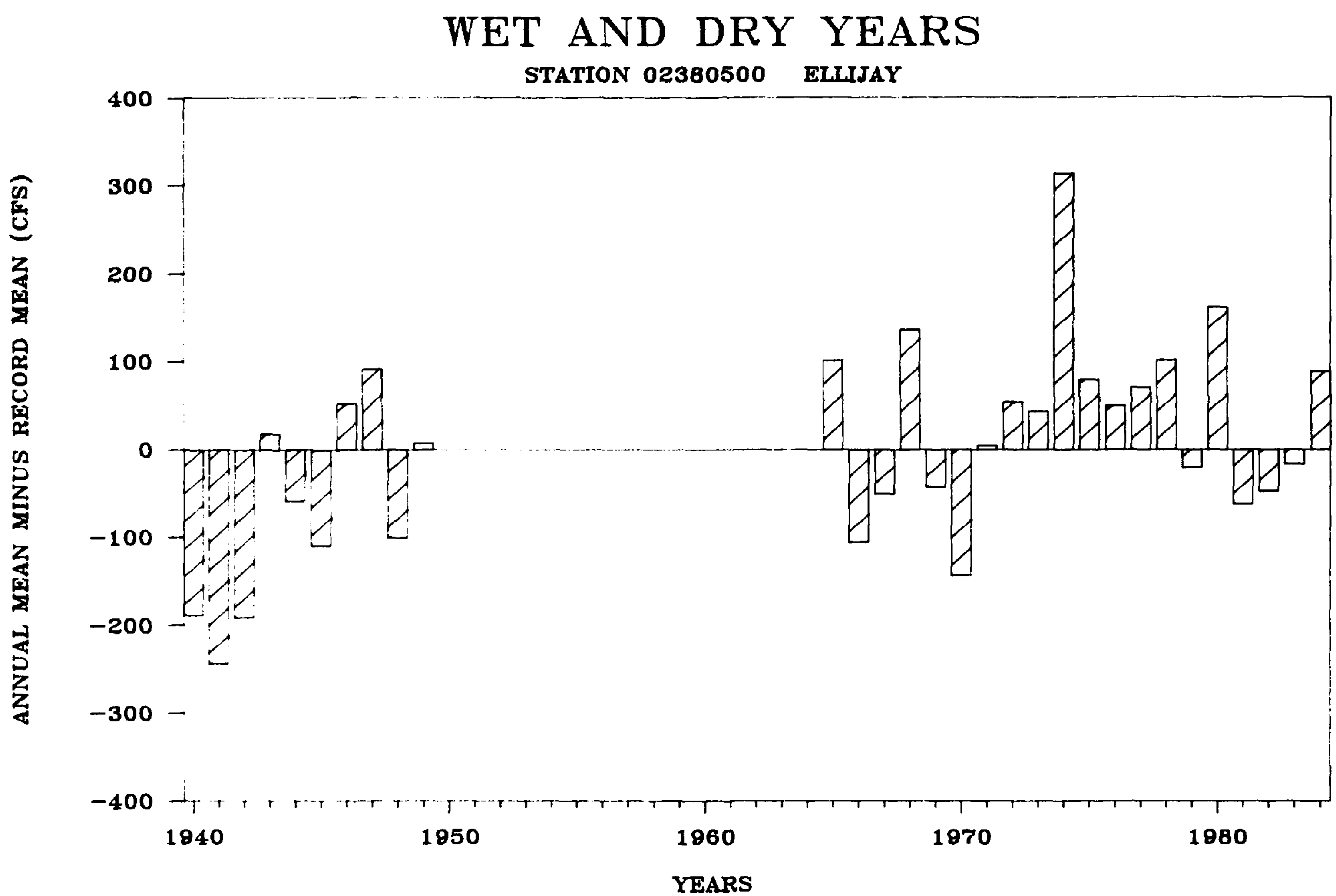

WET AND DRY YEARS
STATION 02380500 ELLIJAY
ANNUAL MEAN MINUS RECORD MEAN (CFS)
400
300
200
100
0
−100
−200
−300
−400
1940
1950
1960
1970
1980
YEARS

FIGURE F-1

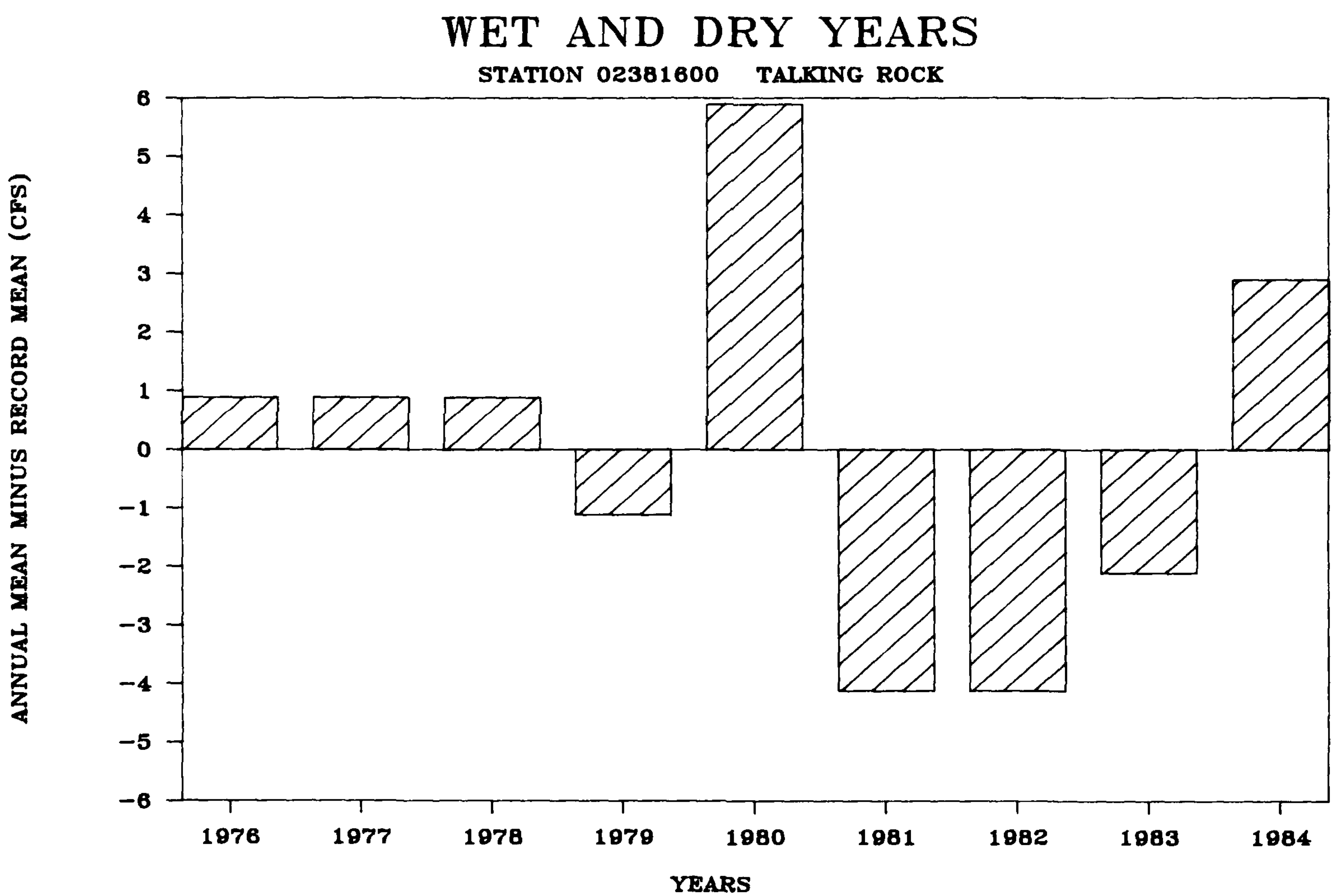

WET AND DRY YEARS
STATION 02381600 TALKING ROCK
ANNUAL MEAN MINUS RECORD MEAN (CFS)
6
5
4
3
2
1
0
−1
−2
−3
−4
−5
−6
1976
1977
1978
1979
1980
1981
1982
1983
1984
YEARS

FIGURE F-2

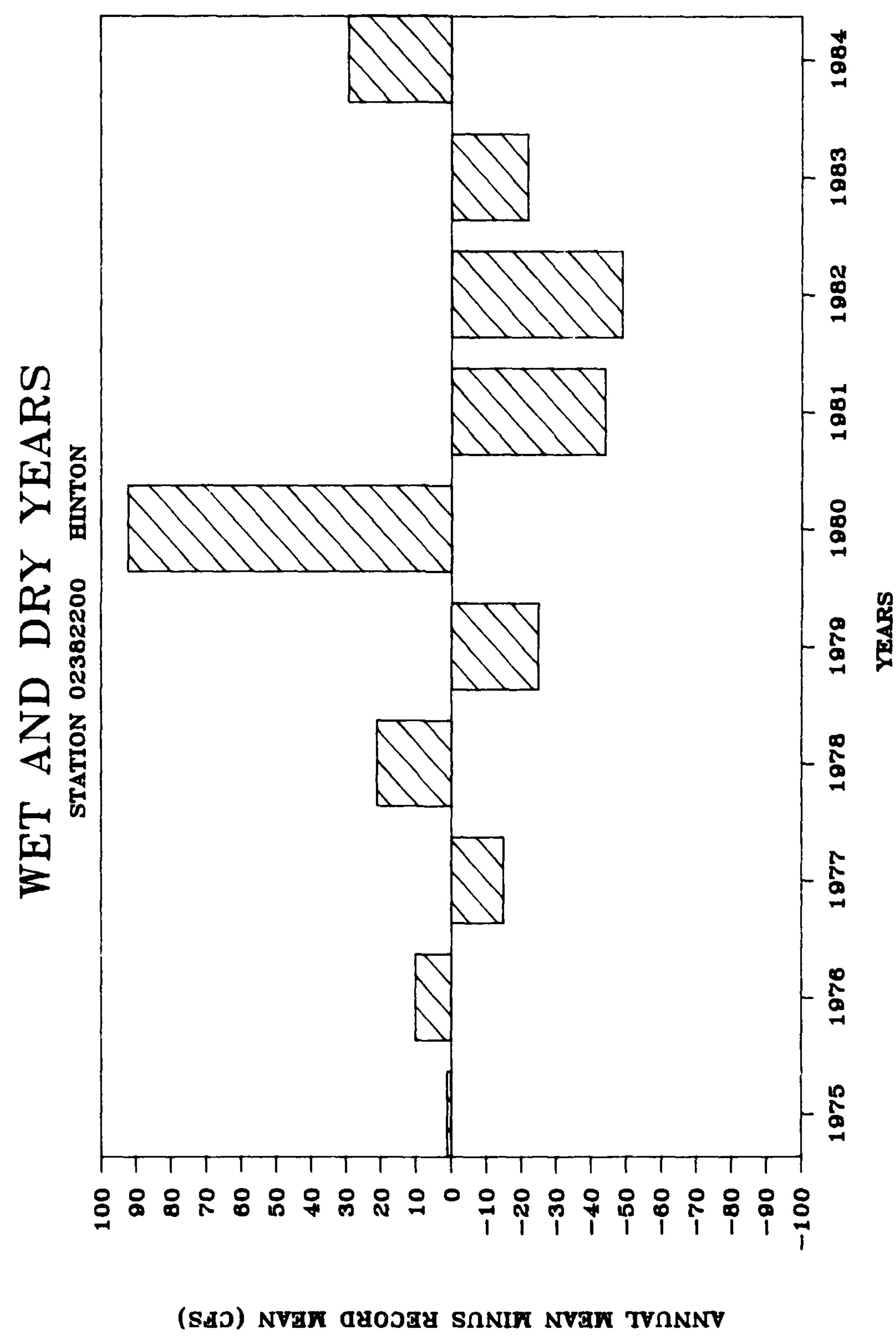

WET AND DRY YEARS
STATION 02382200 HINTON
ANNUAL MEAN MINUS RECORD MEAN (CFS)
100
90
80
70
60
50
40
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
YEARS

FIGURE F-3

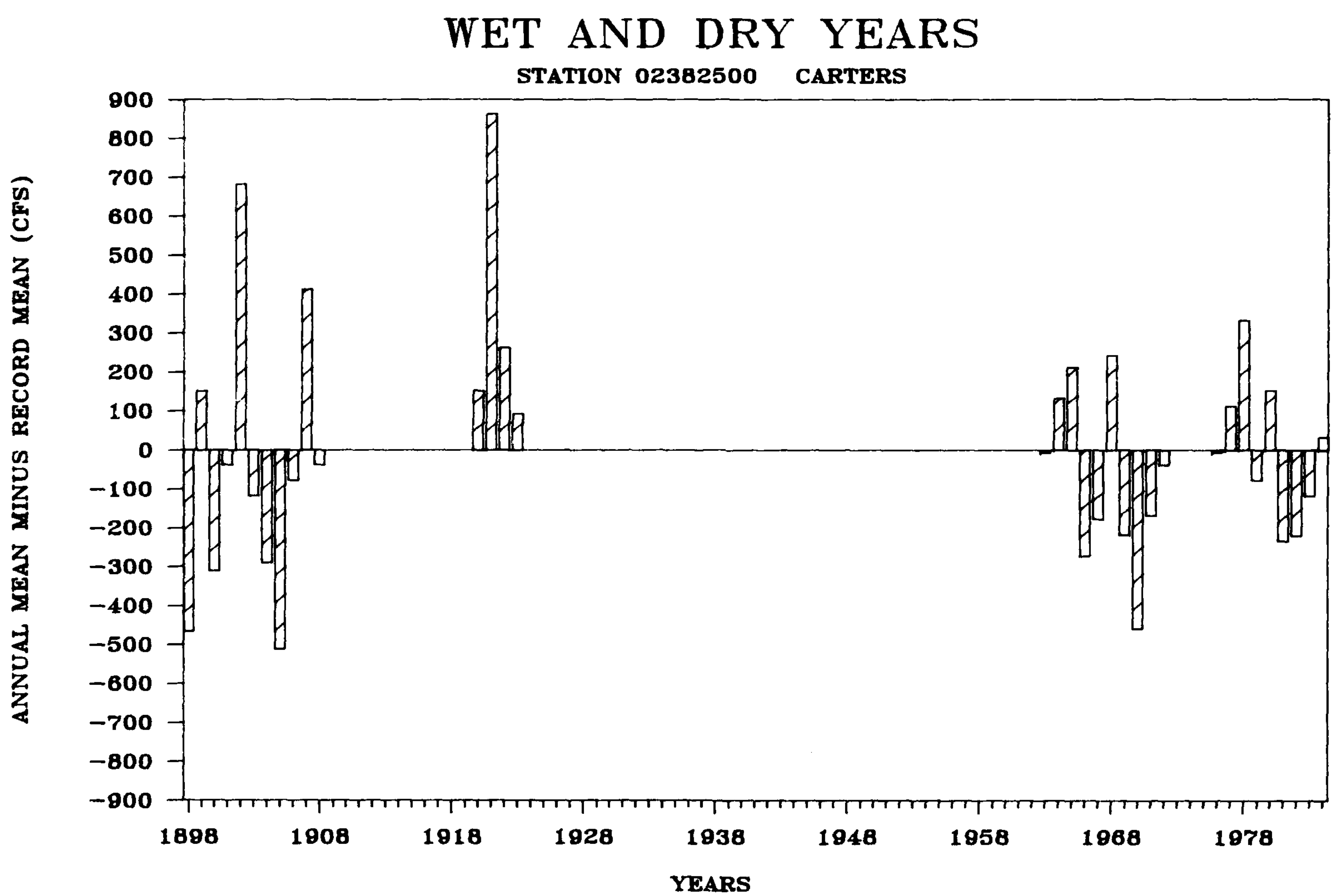

WET AND DRY YEARS
STATION 02382500 CARTERS
ANNUAL MEAN MINUS RECORD MEAN (CFS)
900
800
700
600
500
400
300
200
100
0
−100
−200
−300
−400
−500
−600
−700
−800
−900
1898
1908
1918
1928
1938
1948
1958
1968
1978
YEARS

FIGURE F-4

WET AND DRY YEARS

STATION 02383500 PINE CHAPEL

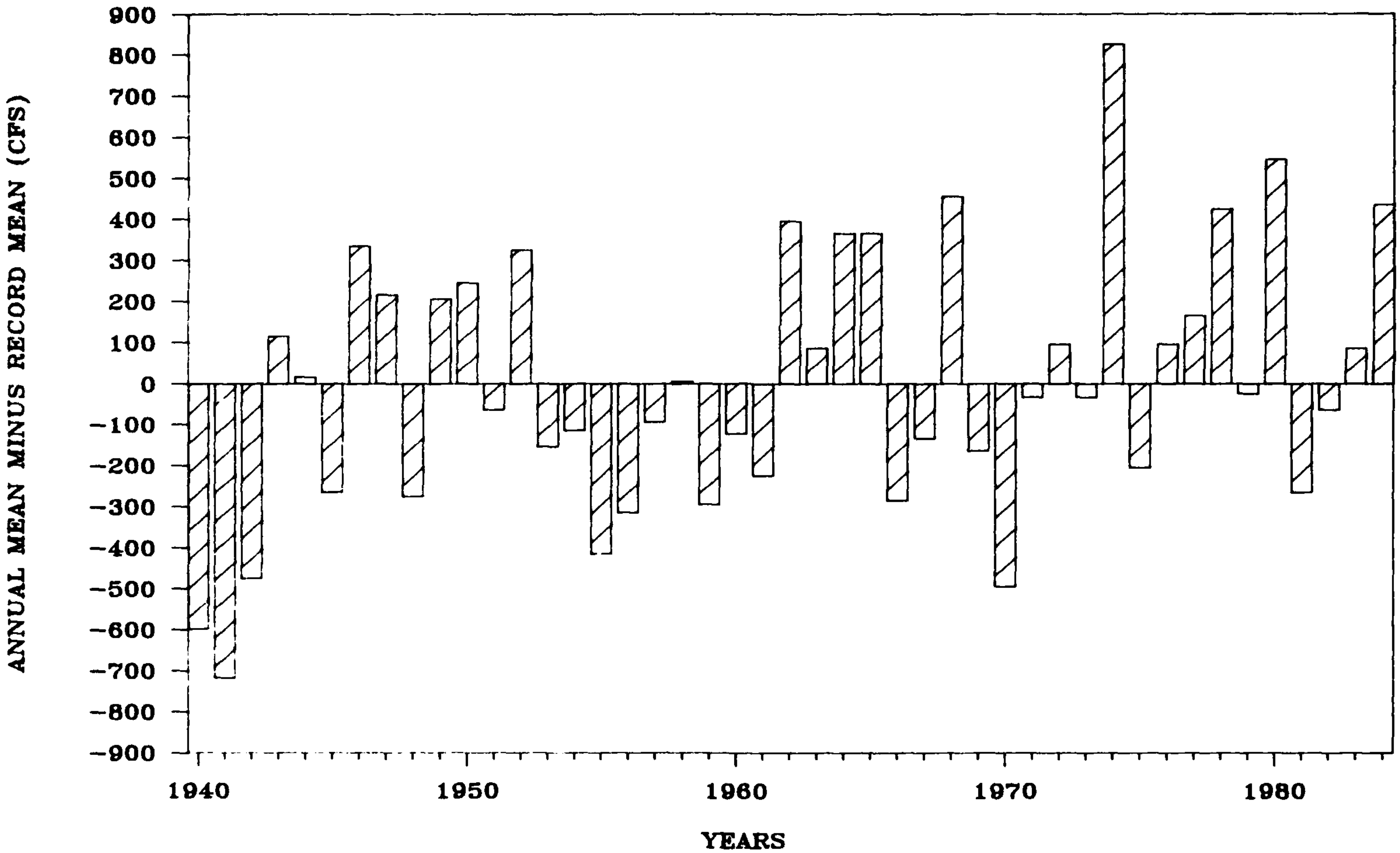


FIGURE F-5

WET AND DRY YEARS

STATION 02384500 ETON

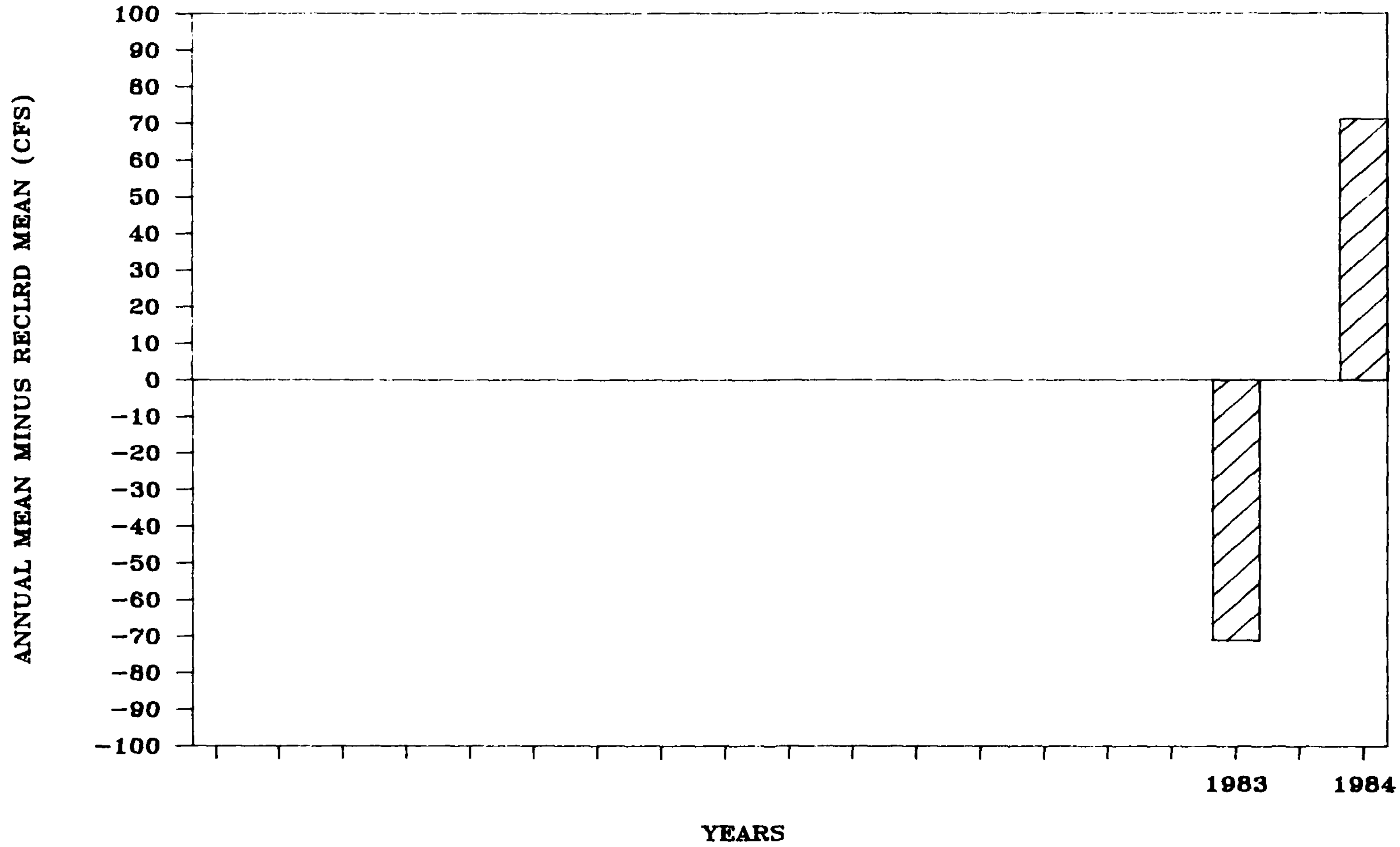


FIGURE F-6

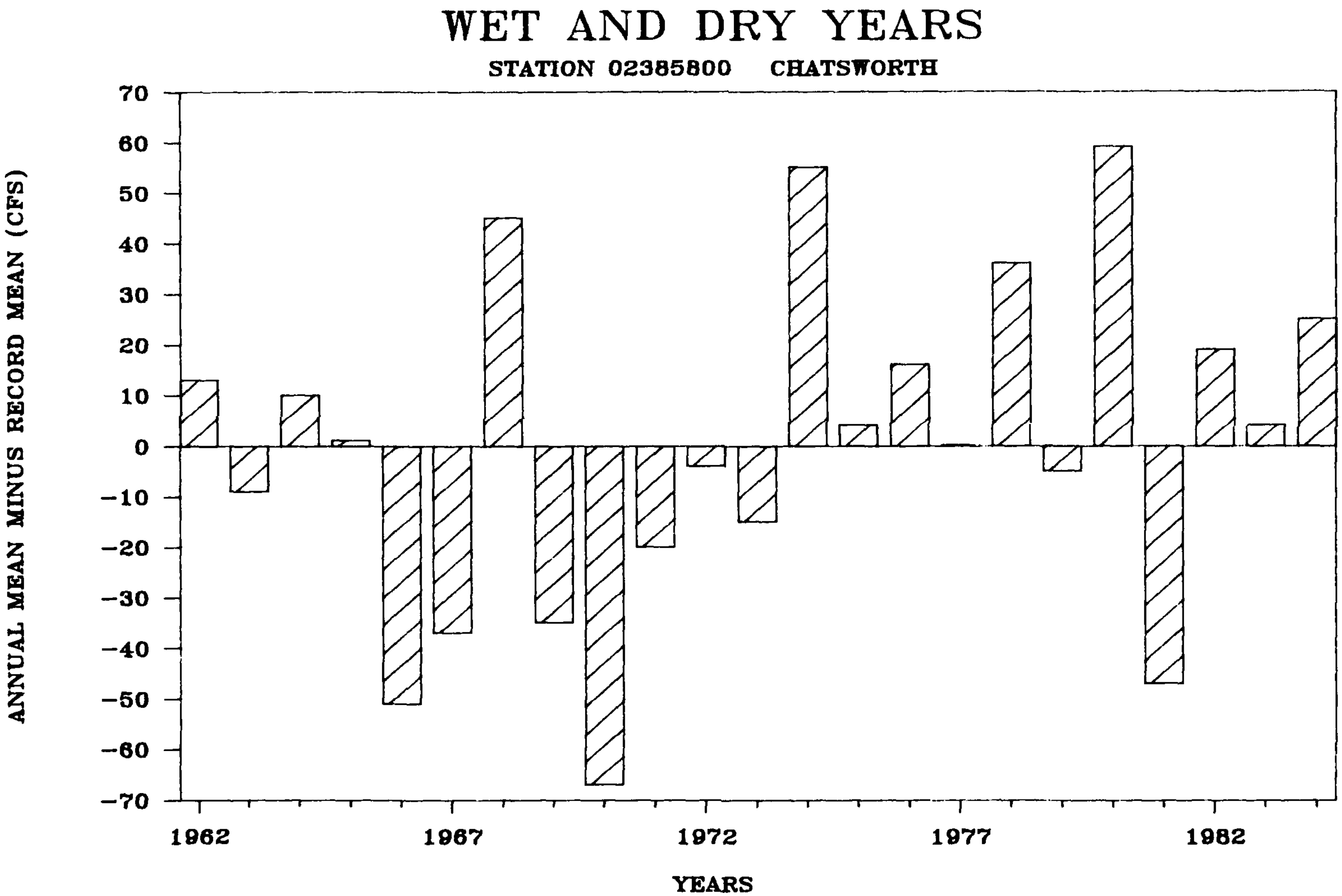

WET AND DRY YEARS
STATION 02385800 CHATSWORTH
ANNUAL MEAN MINUS RECORD MEAN (CFS)
70
60
50
40
30
20
10
0
−10
−20
−30
−40
−50
−60
−70
1962
1967
1972
1977
1982
YEARS

FIGURE F-7

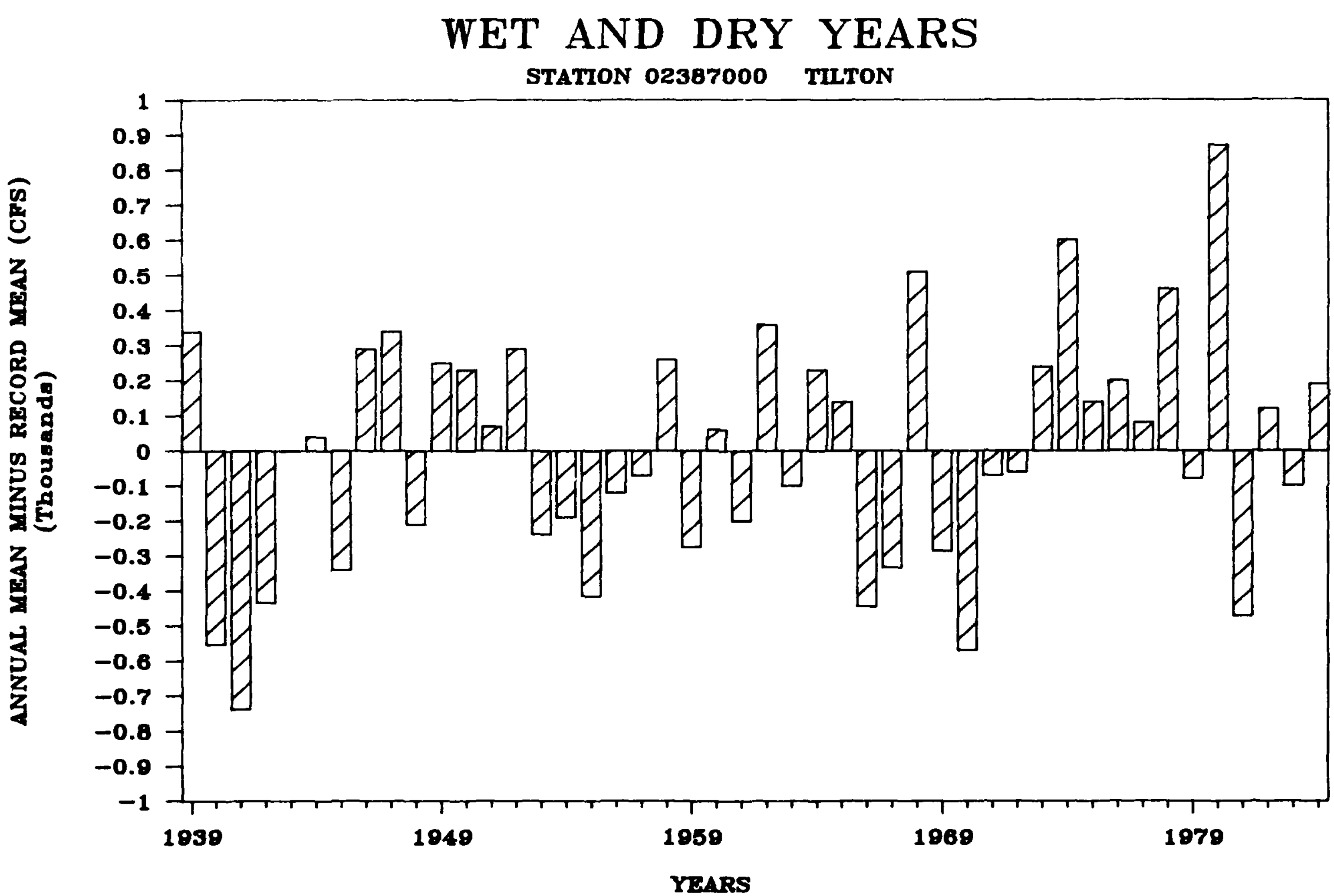
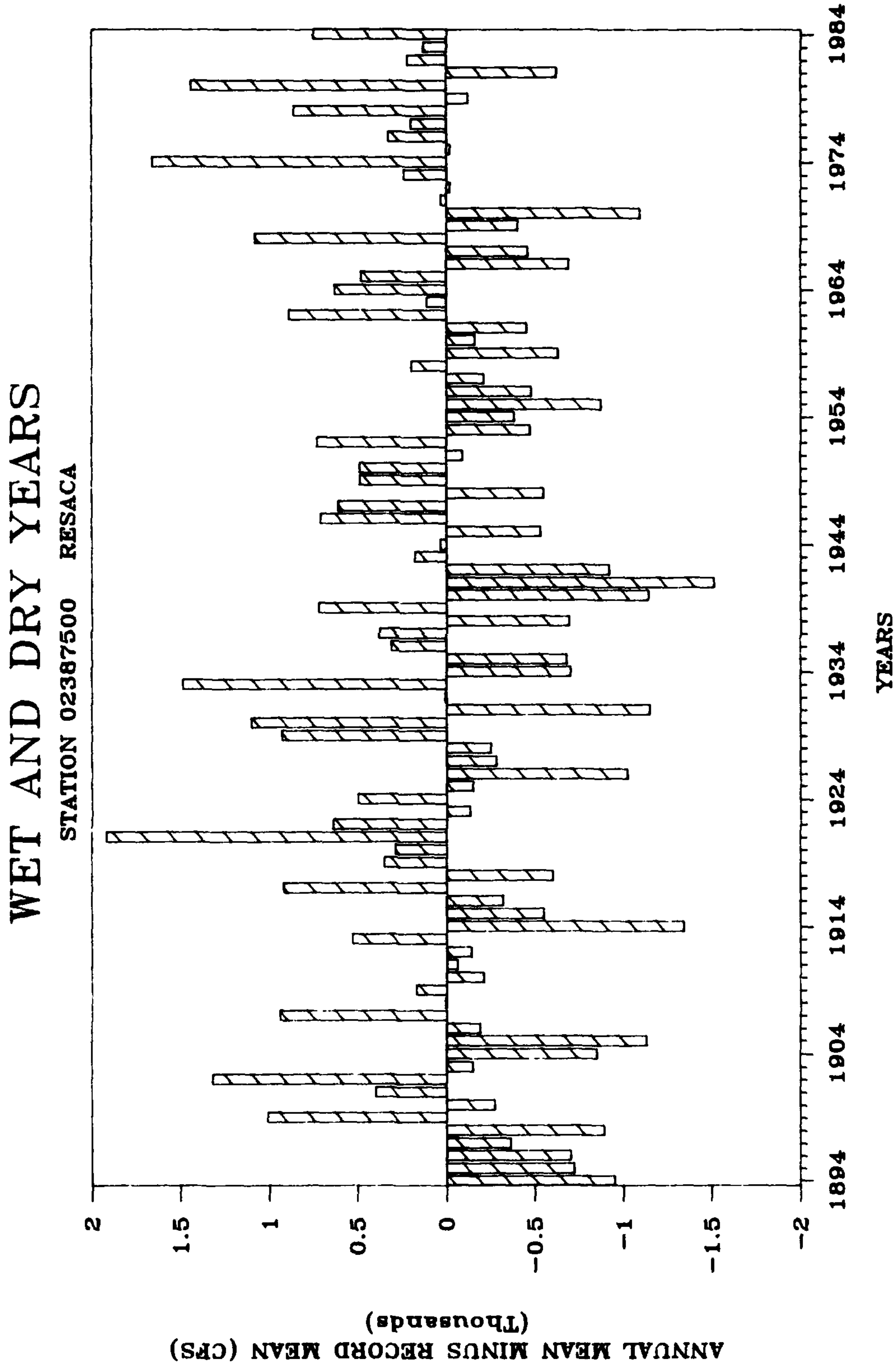

WET AND DRY YEARS
STATION 02387000 TILTON
ANNUAL MEAN MINUS RECORD MEAN (CFS)
(Thousands)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
-0.7
-0.8
-0.9
-1
1939
1949
1959
1969
1979
YEARS

FIGURE F-8



WET AND DRY YEARS
STATION 02387500 RESACA
YEARS
1894
1904
1914
1924
1934
1944
1954
1964
1974
1984
ANNUAL MEAN MINUS RECORD MEAN (CFS)
(Thousands)
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2

FIGURE F-9

WET AND DRY YEARS

STATION 02388300 ROME

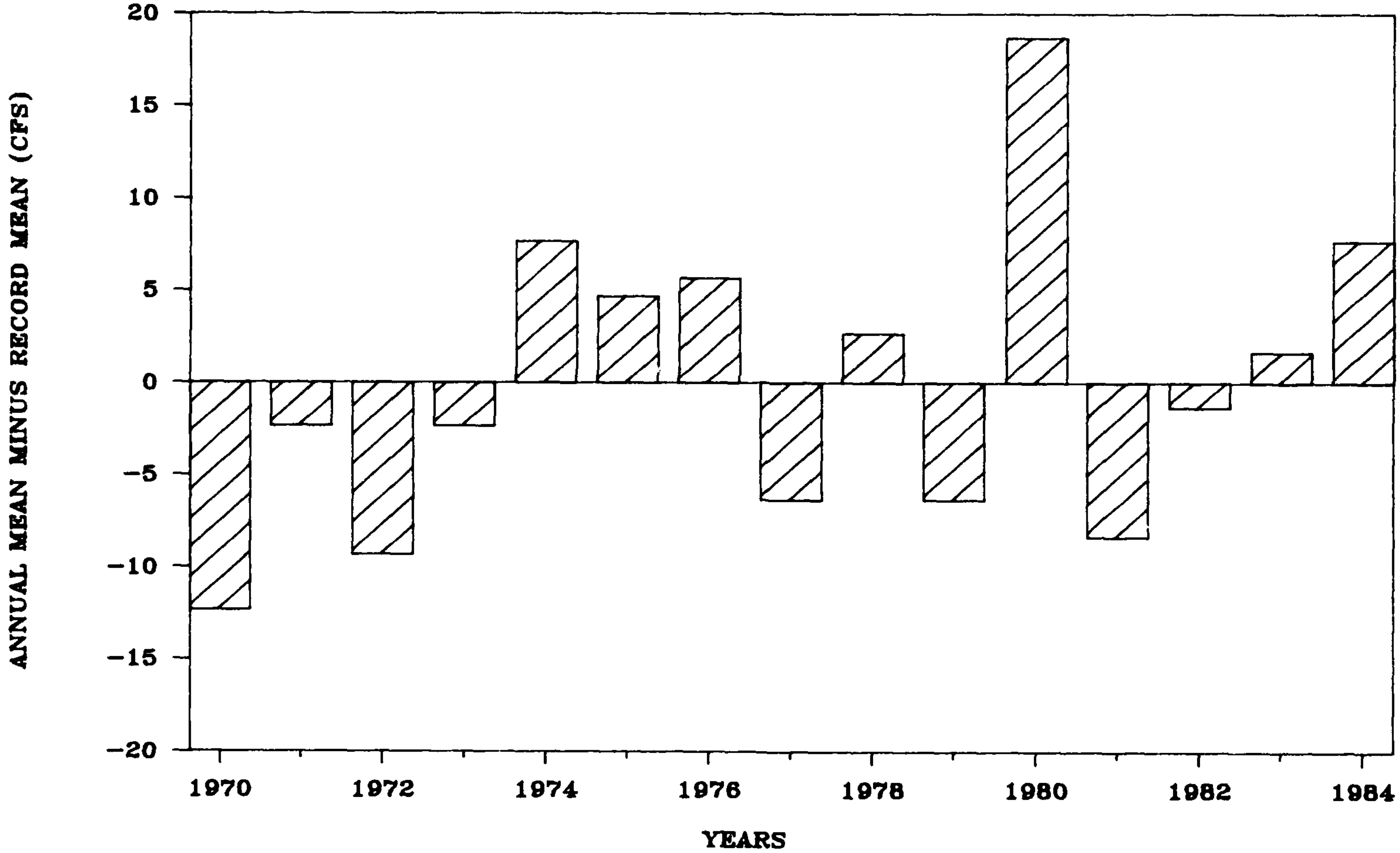


FIGURE F-10

WET AND DRY YEARS

STATION 02388320 ARMUCHEE

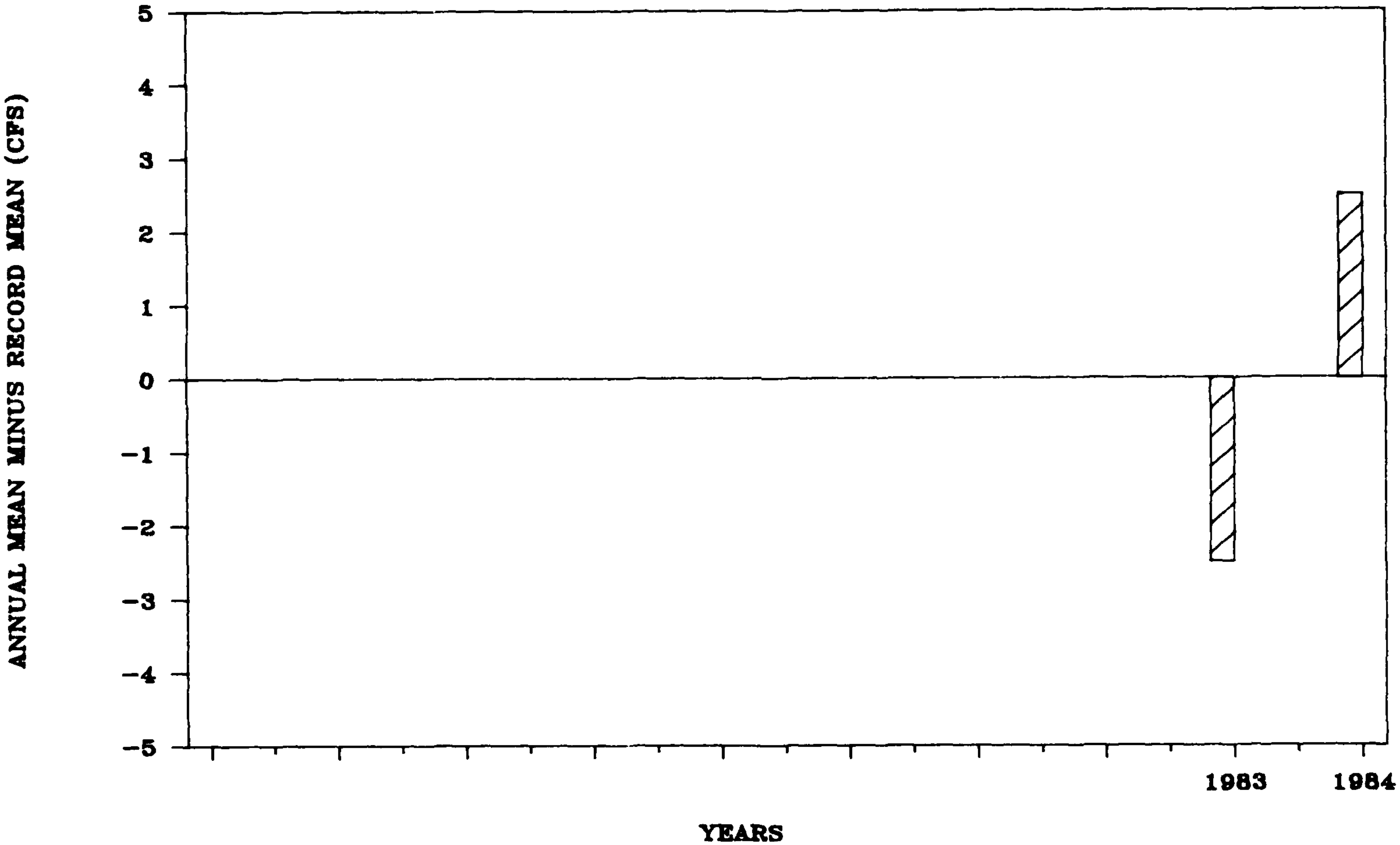


FIGURE F-11

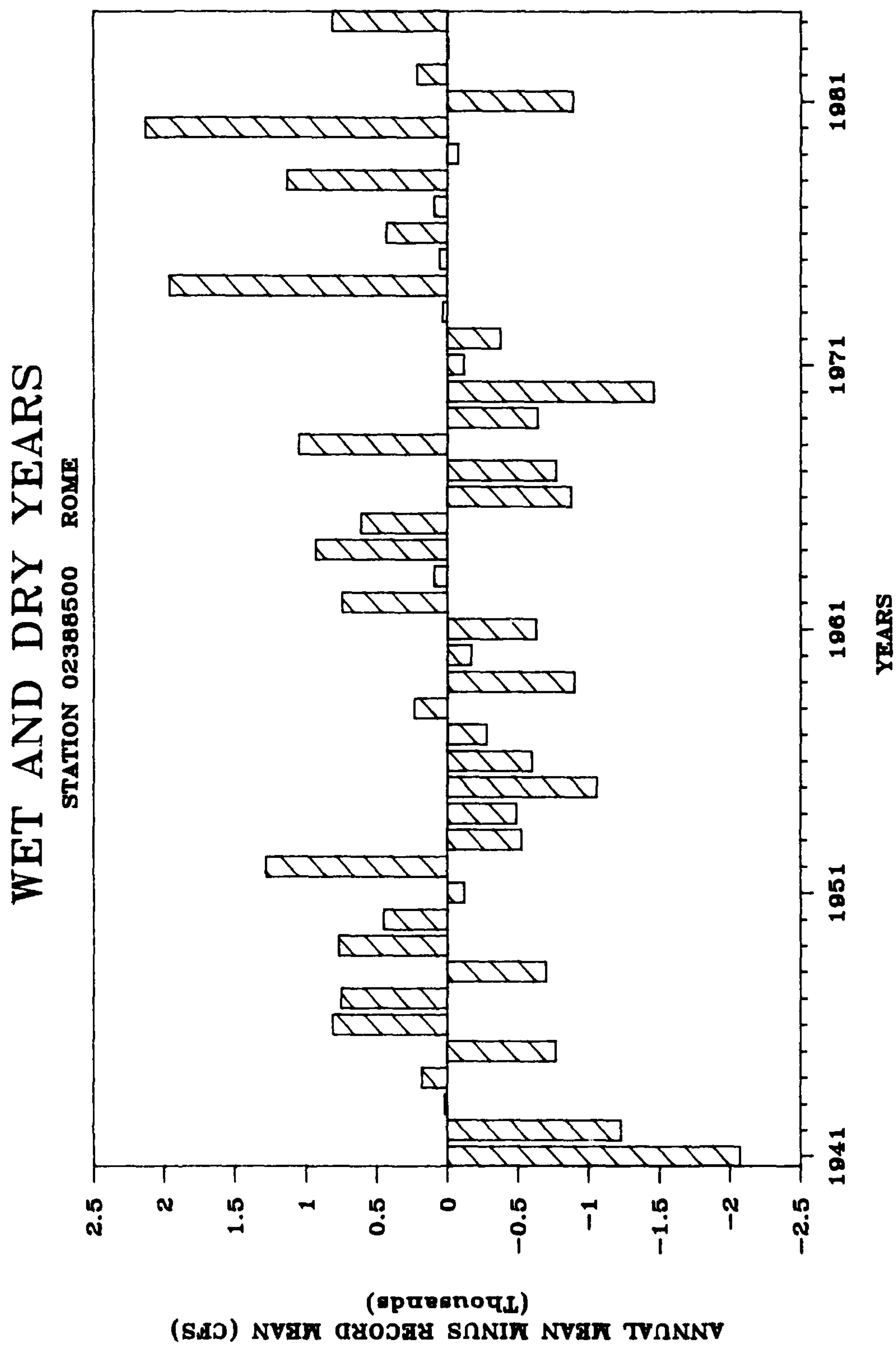

WET AND DRY YEARS
STATION 02388500 ROME
ANNUAL MEAN MINUS RECORD MEAN (CFS)
(Thousands)
YEARS
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
1941
1951
1961
1971
1981

FIGURE F-12

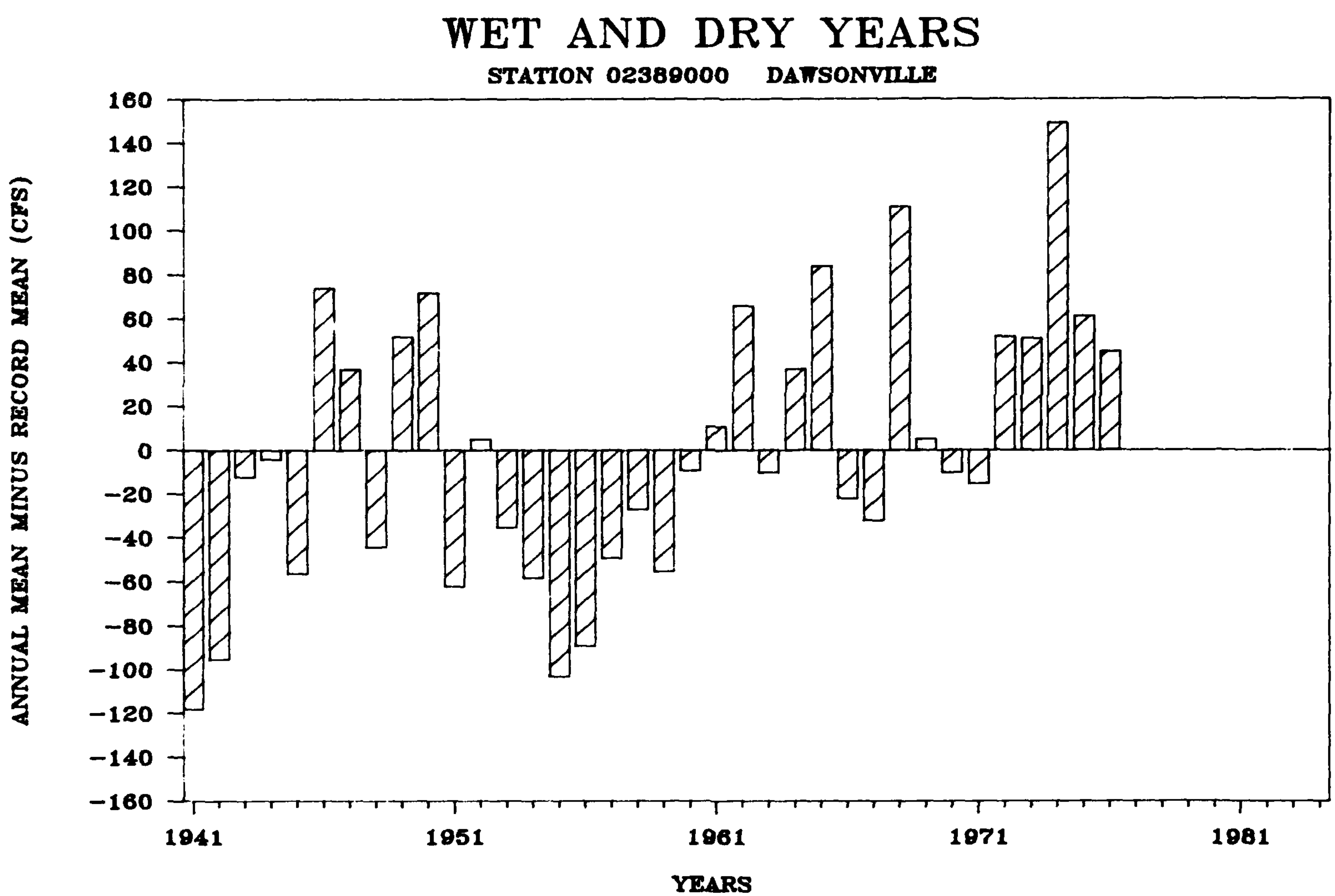
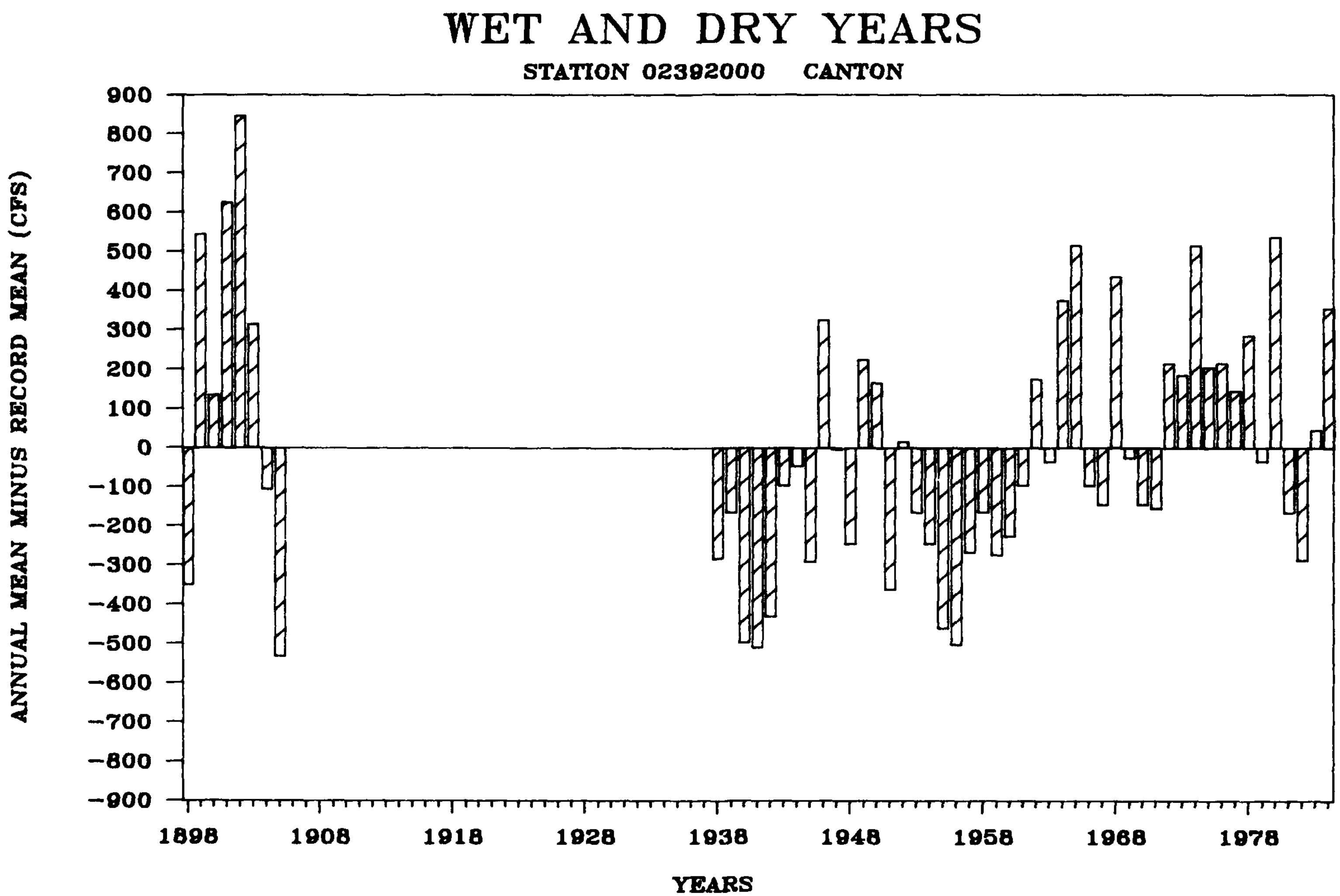
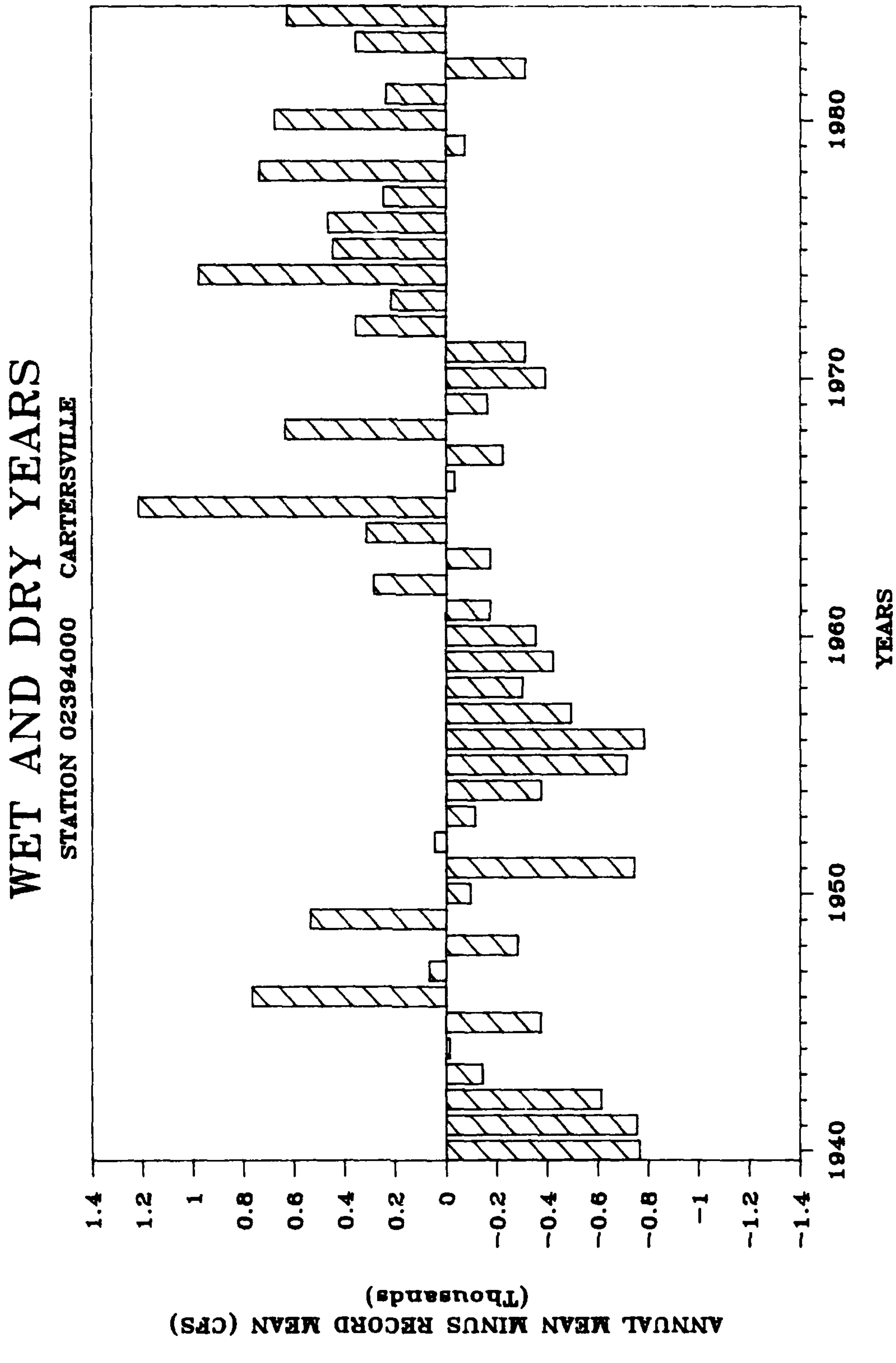

WET AND DRY YEARS
STATION 02389000 DAWSONVILLE
ANNUAL MEAN MINUS RECORD MEAN (CFS)
160
140
120
100
80
60
40
20
0
-20
-40
-60
-80
-100
-120
-140
-160
1941
1951
1961
1971
1981
YEARS

FIGURE F-13



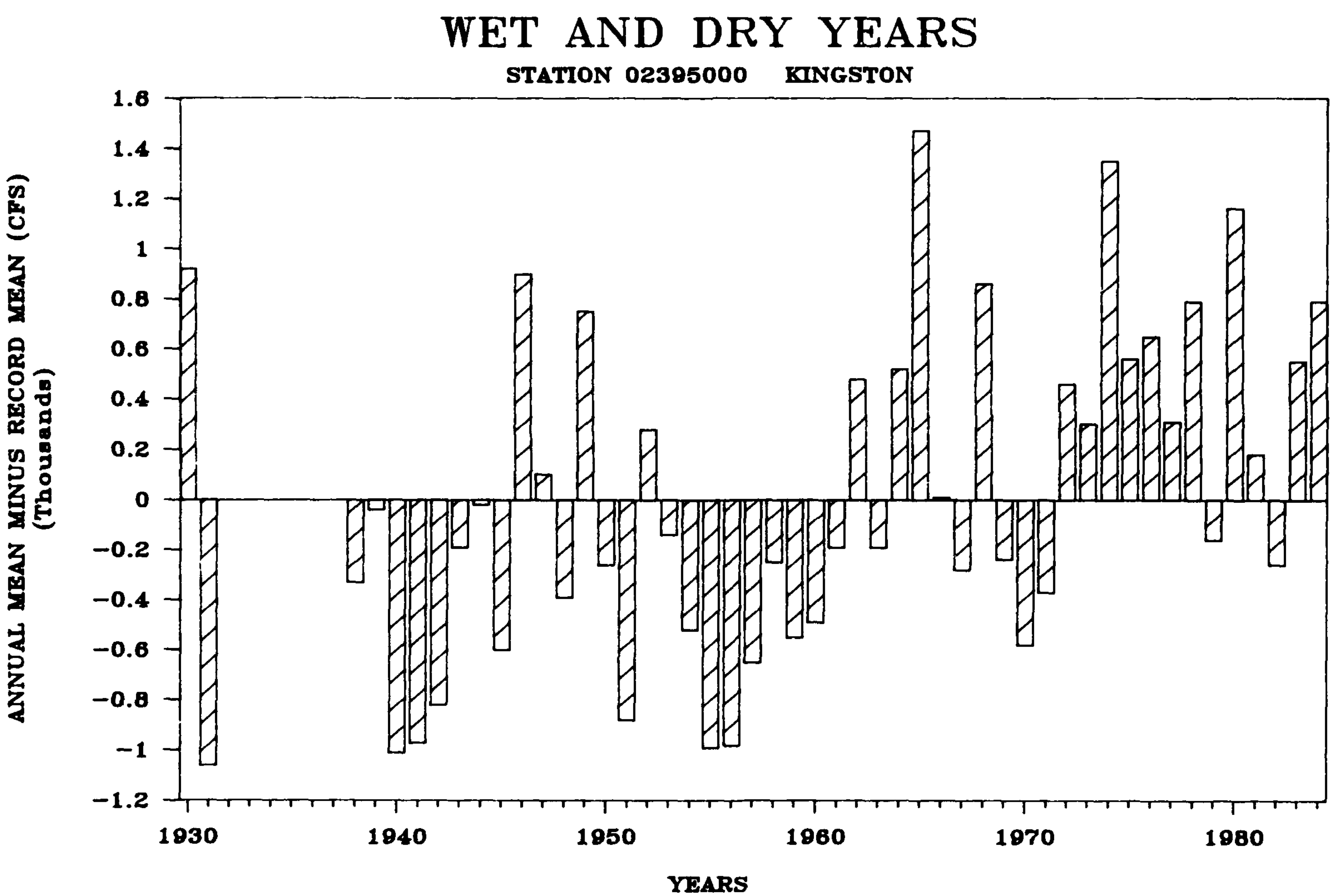
WET AND DRY YEARS
STATION 02392000 CANTON
ANNUAL MEAN MINUS RECORD MEAN (CFS)
900
800
700
600
500
400
300
200
100
0
-100
-200
-300
-400
-500
-600
-700
-800
-900
1898
1908
1918
1928
1938
1948
1958
1968
1978
YEARS

FIGURE F-14



WET AND DRY YEARS
STATION 02394000 CARTERSVILLE
ANNUAL MEAN MINUS RECORD MEAN (CFS)
(Thousands)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1.2
-1.4
1940
1950
1960
1970
1980
YEARS

FIGURE F-15



WET AND DRY YEARS
STATION 02395000 KINGSTON
ANNUAL MEAN MINUS RECORD MEAN (CFS)
(Thousands)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1.2
1930
1940
1950
1960
1970
1980
YEARS

FIGURE F-16

WET AND DRY YEARS

STATION 02395120 KINGSTON

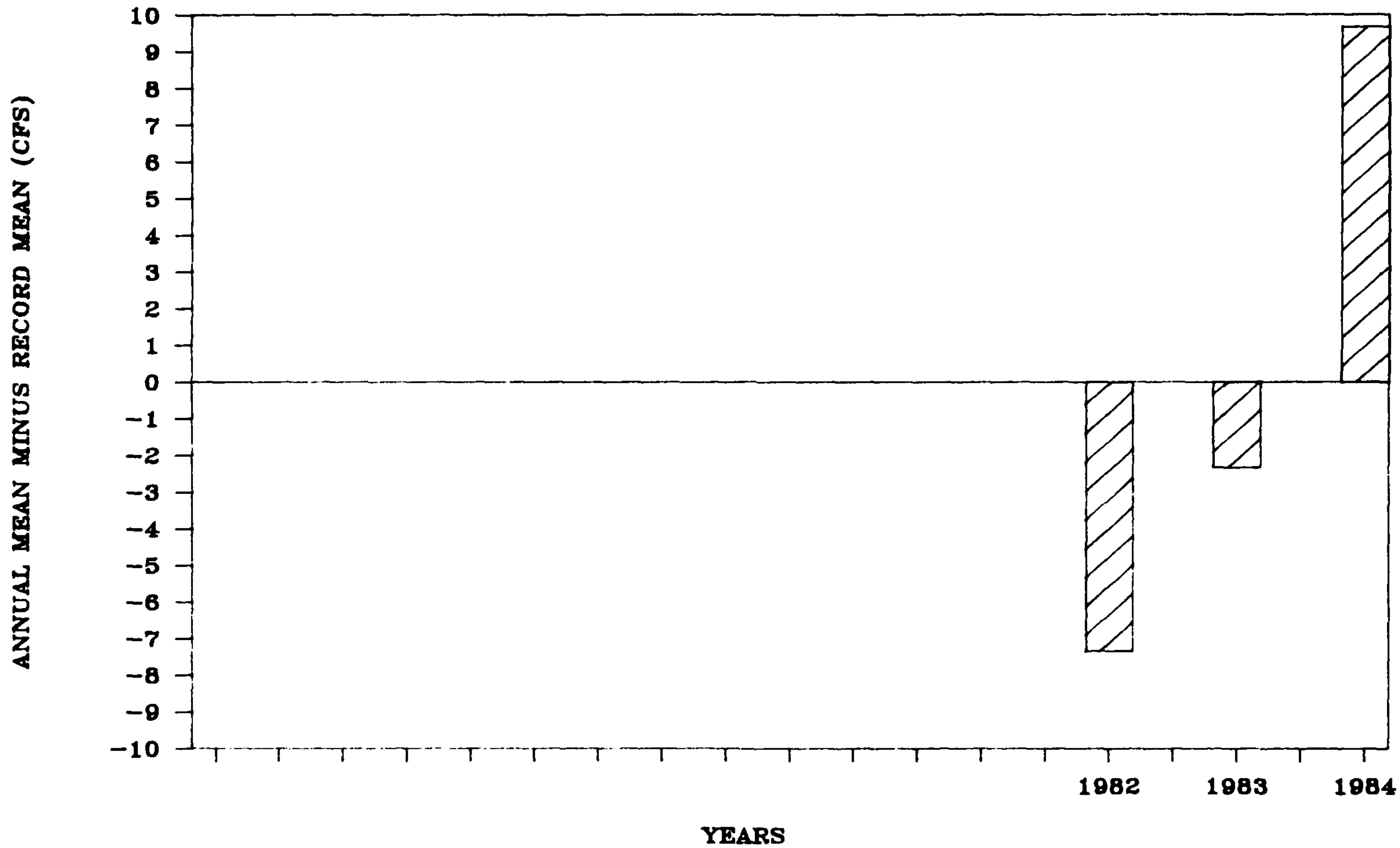


FIGURE F-17

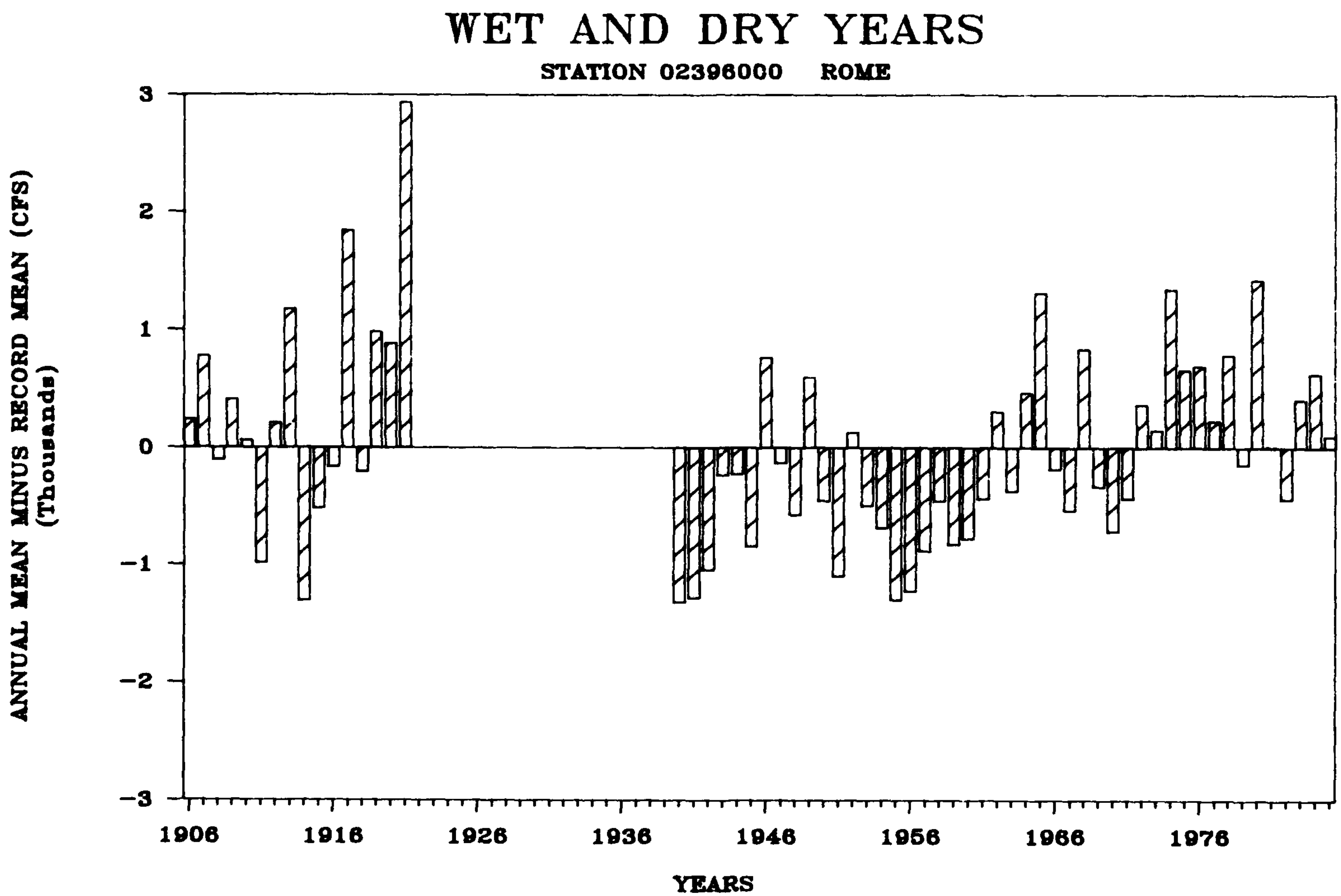

WET AND DRY YEARS
STATION 02396000 ROME
ANNUAL MEAN MINUS RECORD MEAN (CFS)
(Thousands)
3
2
1
0
−1
−2
−3
1906
1916
1926
1936
1946
1956
1966
1976
YEARS

FIGURE F−18

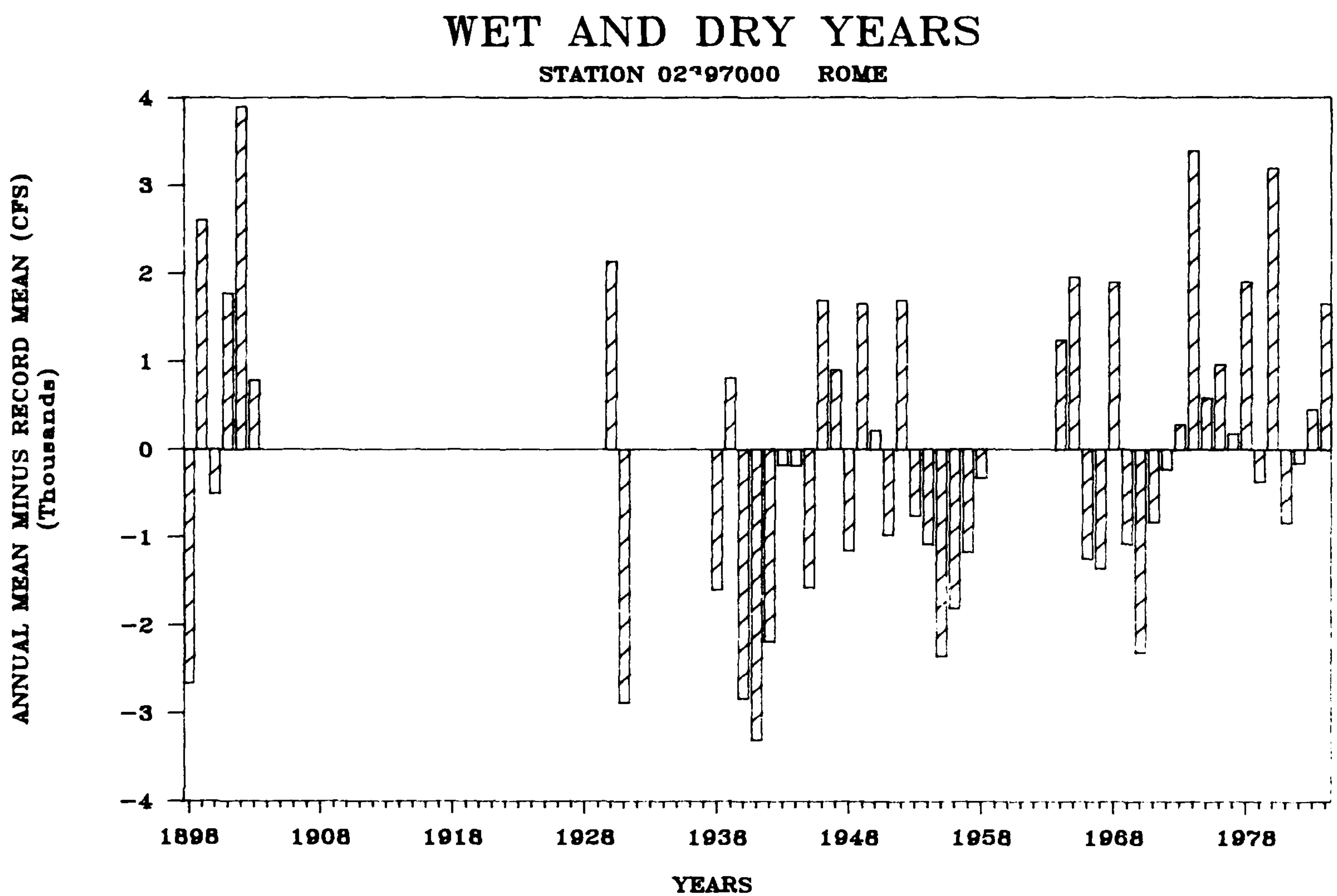
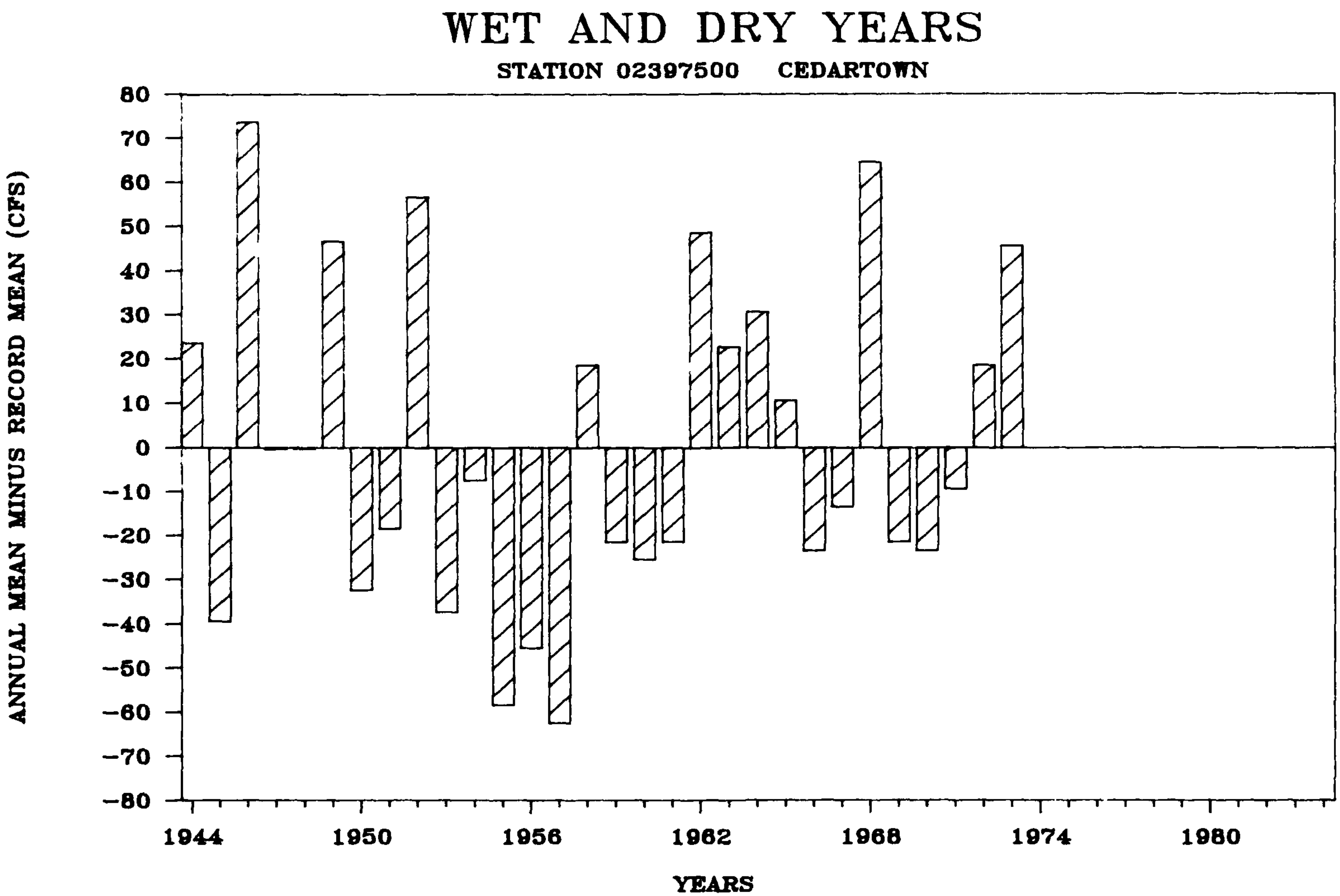

WET AND DRY YEARS
STATION 02397000 ROME
ANNUAL MEAN MINUS RECORD MEAN (CFS)
(Thousands)
4
3
2
1
0
−1
−2
−3
−4
1898
1908
1918
1928
1938
1948
1958
1968
1978
YEARS

FIGURE F-19



WET AND DRY YEARS
STATION 02397500 CEDARTOWN
ANNUAL MEAN MINUS RECORD MEAN (CFS)
80
70
60
50
40
30
20
10
0
−10
−20
−30
−40
−50
−60
−70
−80
1944
1950
1956
1962
1968
1974
1980
YEARS

FIGURE F-20

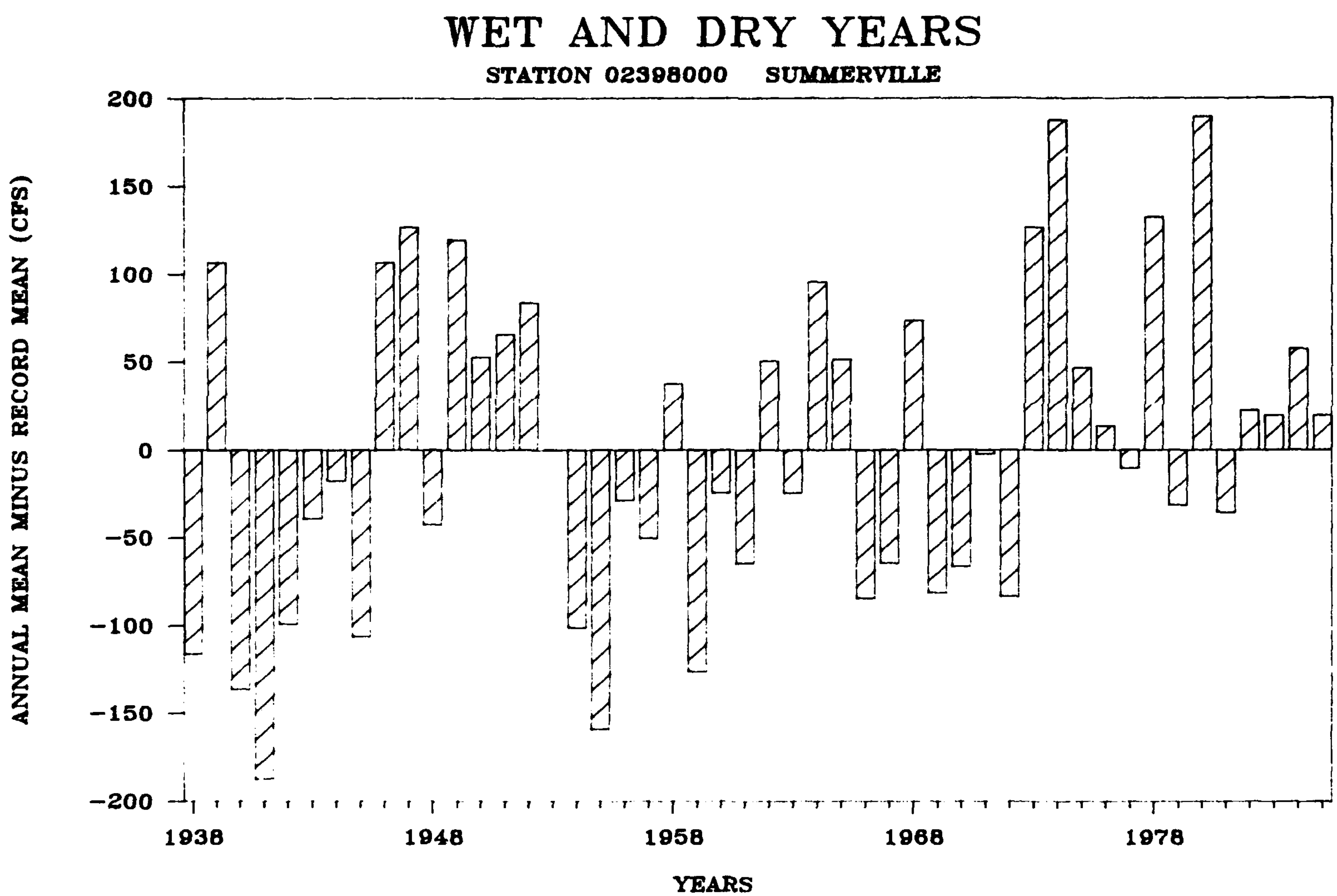

WET AND DRY YEARS
STATION 02398000 SUMMERVILLE
ANNUAL MEAN MINUS RECORD MEAN (CFS)
200
150
100
50
0
-50
-100
-150
-200
1938
1948
1958
1968
1978
YEARS

FIGURE F-21

LOW–FLOW MONTHS, JUNE–NOVEMBER

STATION 02382500 CARTERS

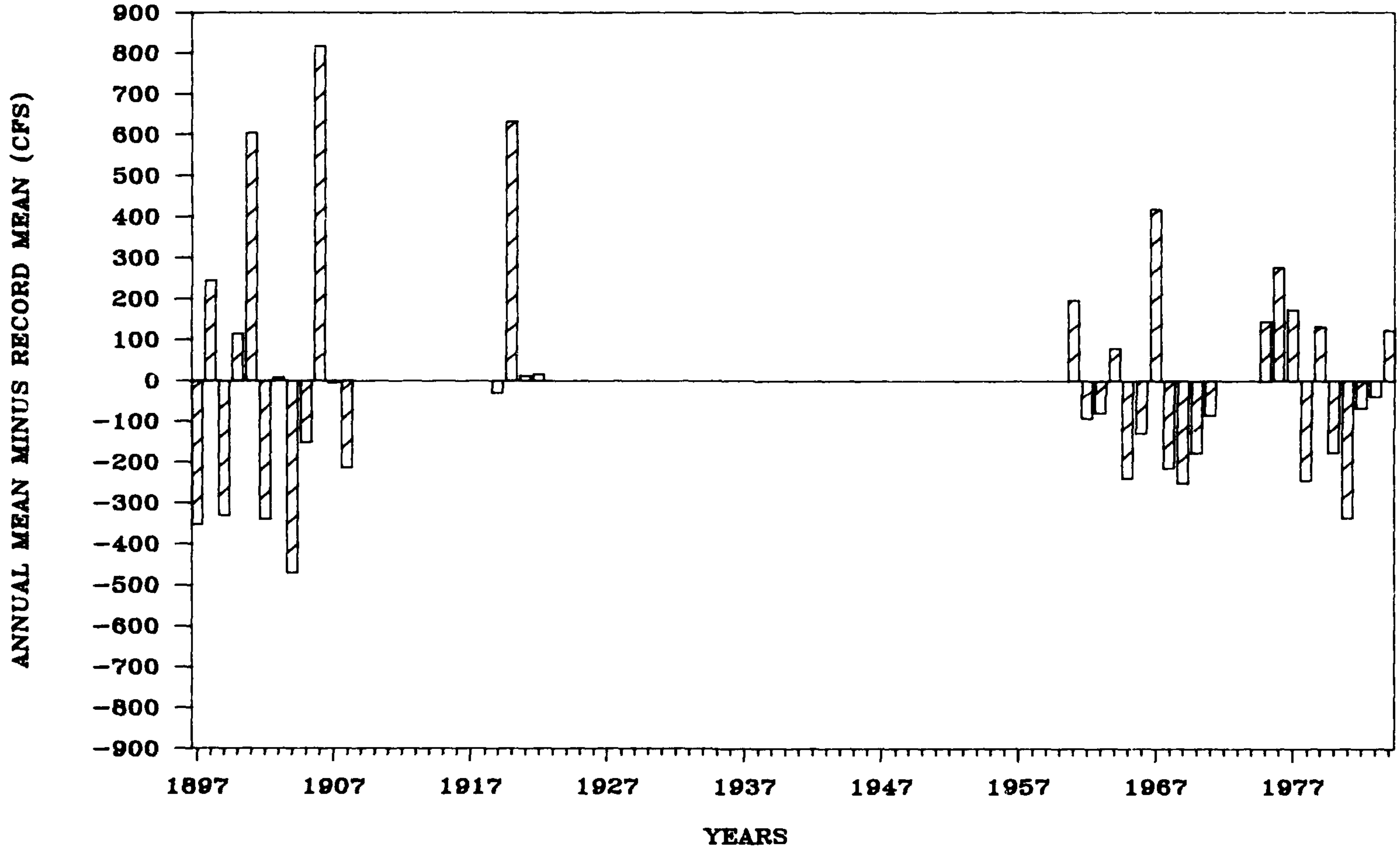
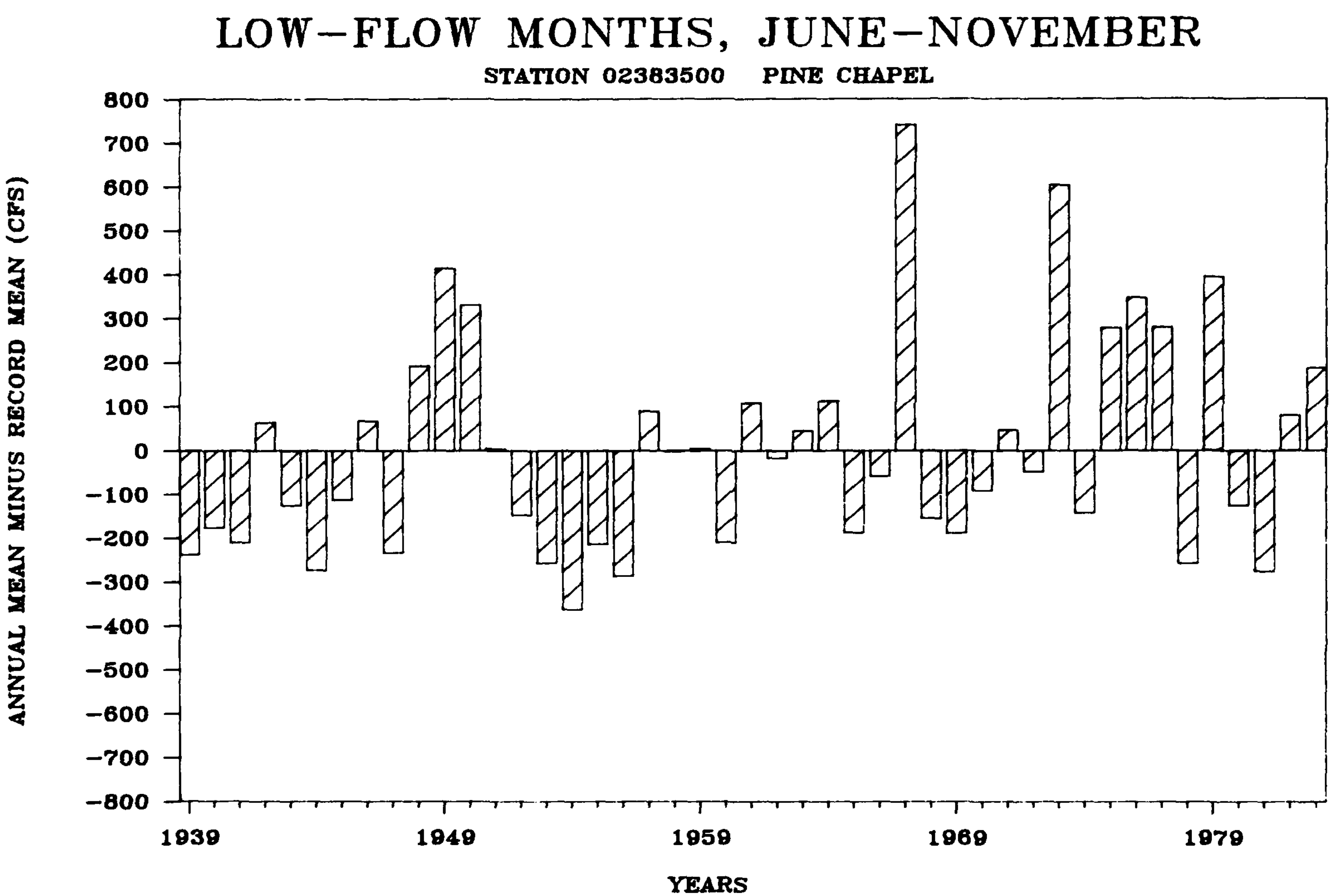


FIGURE F–22



LOW-FLOW MONTHS, JUNE-NOVEMBER
STATION 02383500 PINE CHAPEL
ANNUAL MEAN MINUS RECORD MEAN (CFS)
800
700
600
500
400
300
200
100
0
-100
-200
-300
-400
-500
-600
-700
-800
1939
1949
1959
1969
1979
YEARS

FIGURE F-23

LOW-FLOW MONTHS, JUNE-NOVEMBER

STATION 02387000 TILTON

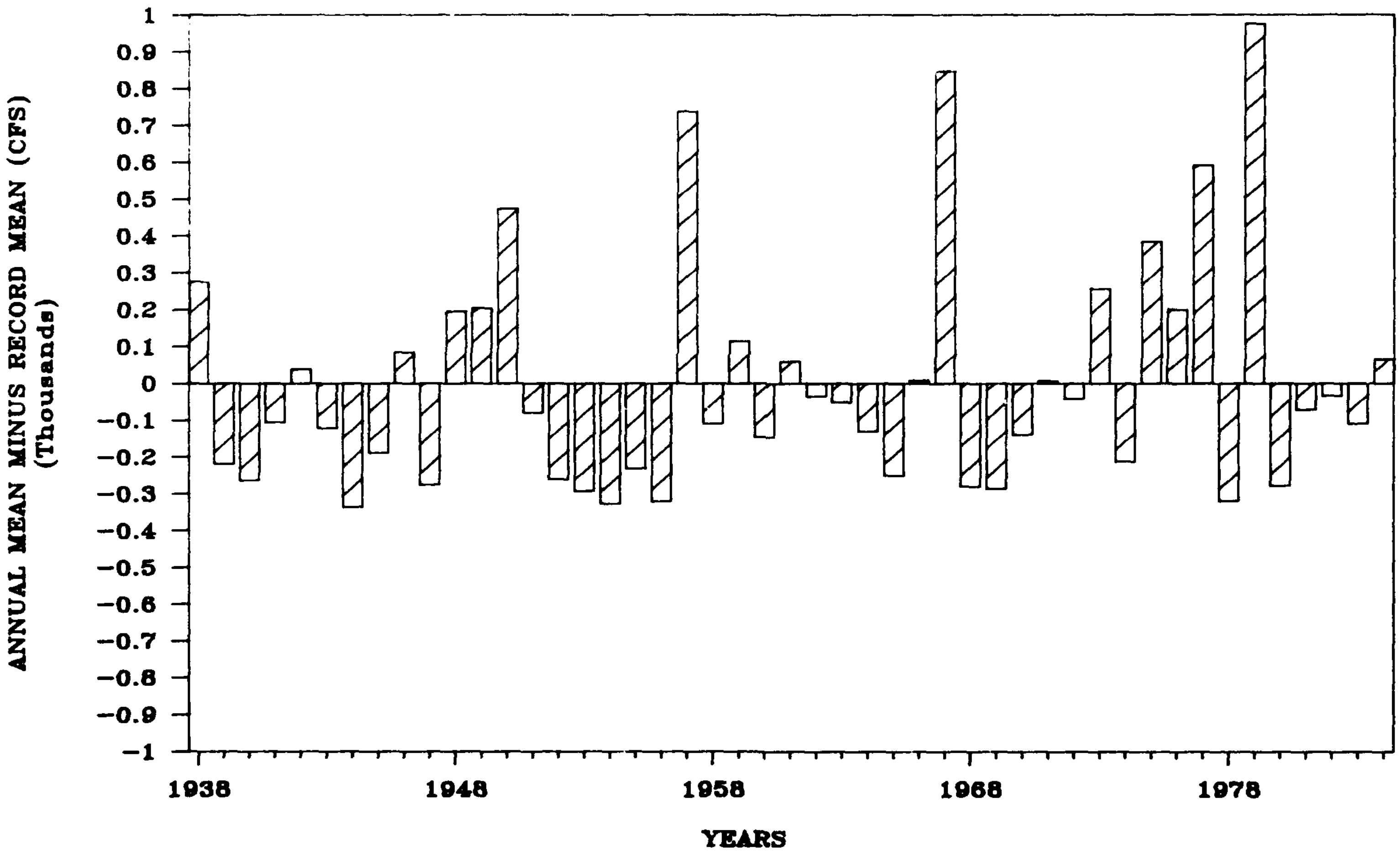
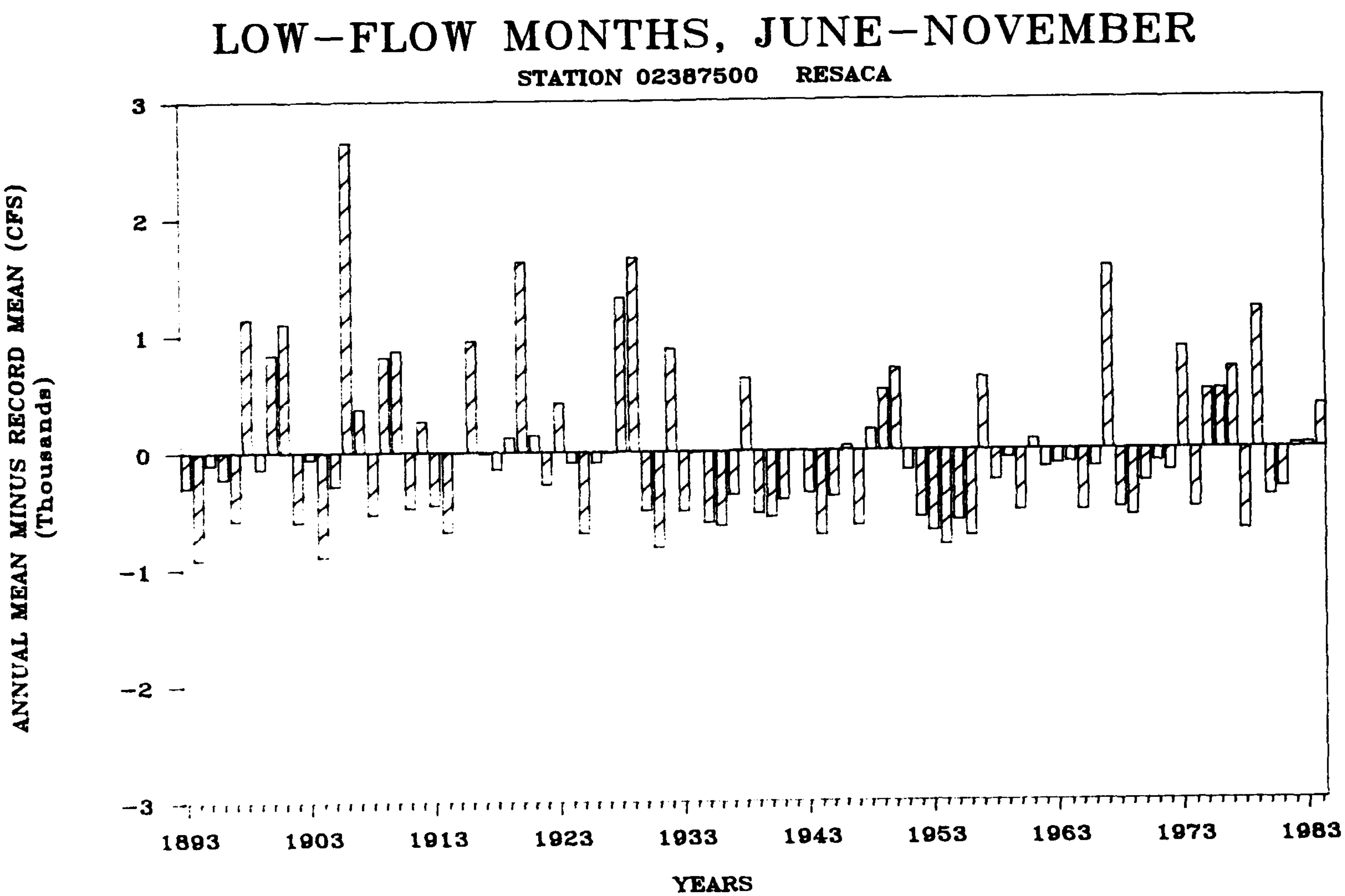
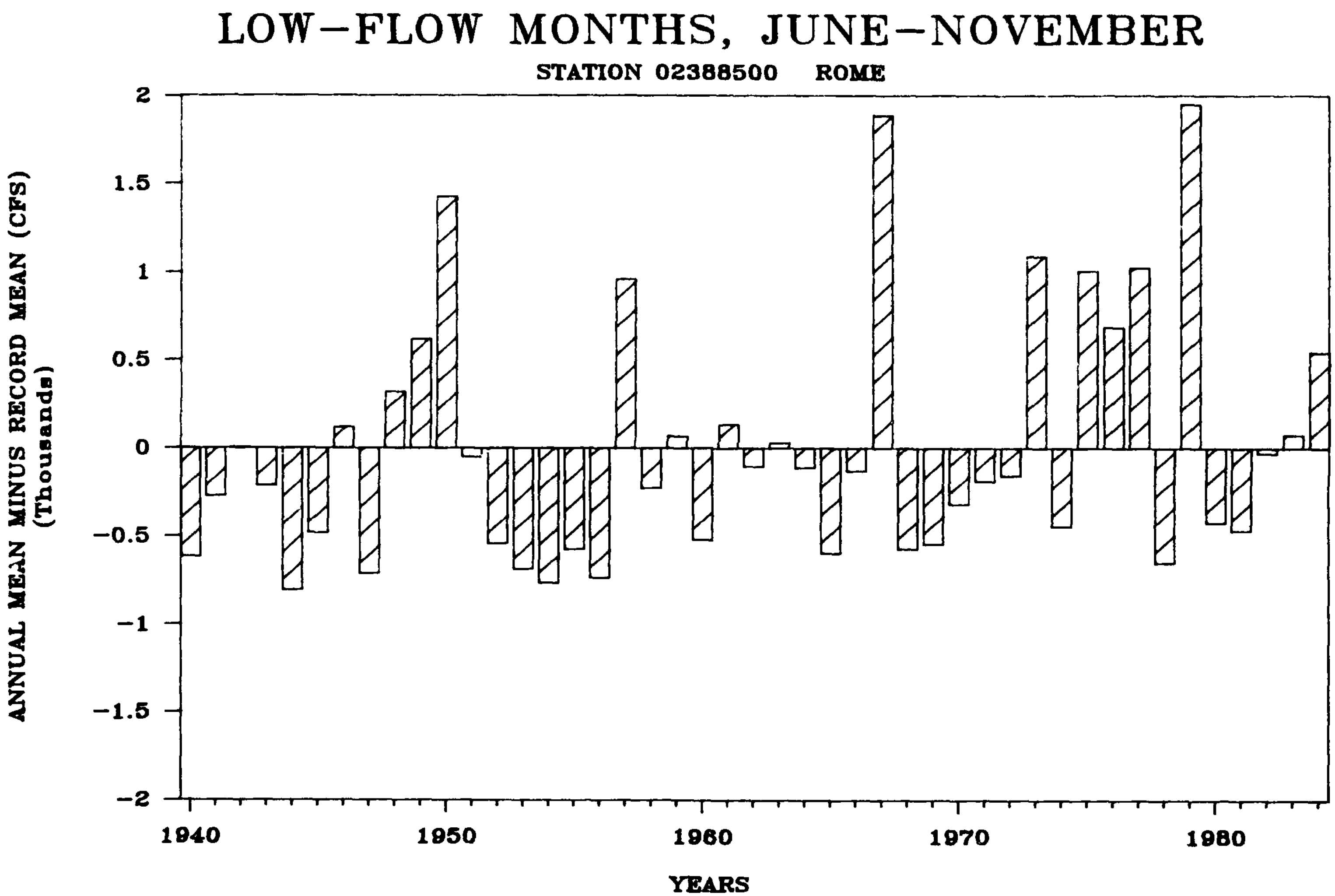


FIGURE F-24



LOW-FLOW MONTHS, JUNE-NOVEMBER
STATION 02387500 RESACA
ANNUAL MEAN MINUS RECORD MEAN (CFS)
(Thousands)
3
2
1
0
-1
-2
-3
1893
1903
1913
1923
1933
1943
1953
1963
1973
1983
YEARS

FIGURE F-25



LOW–FLOW MONTHS, JUNE–NOVEMBER
STATION 02388500 ROME
ANNUAL MEAN MINUS RECORD MEAN (CFS)
(Thousands)
2
1.5
1
0.5
0
−0.5
−1
−1.5
−2
1940
1950
1960
1970
1980
YEARS

FIGURE F–26

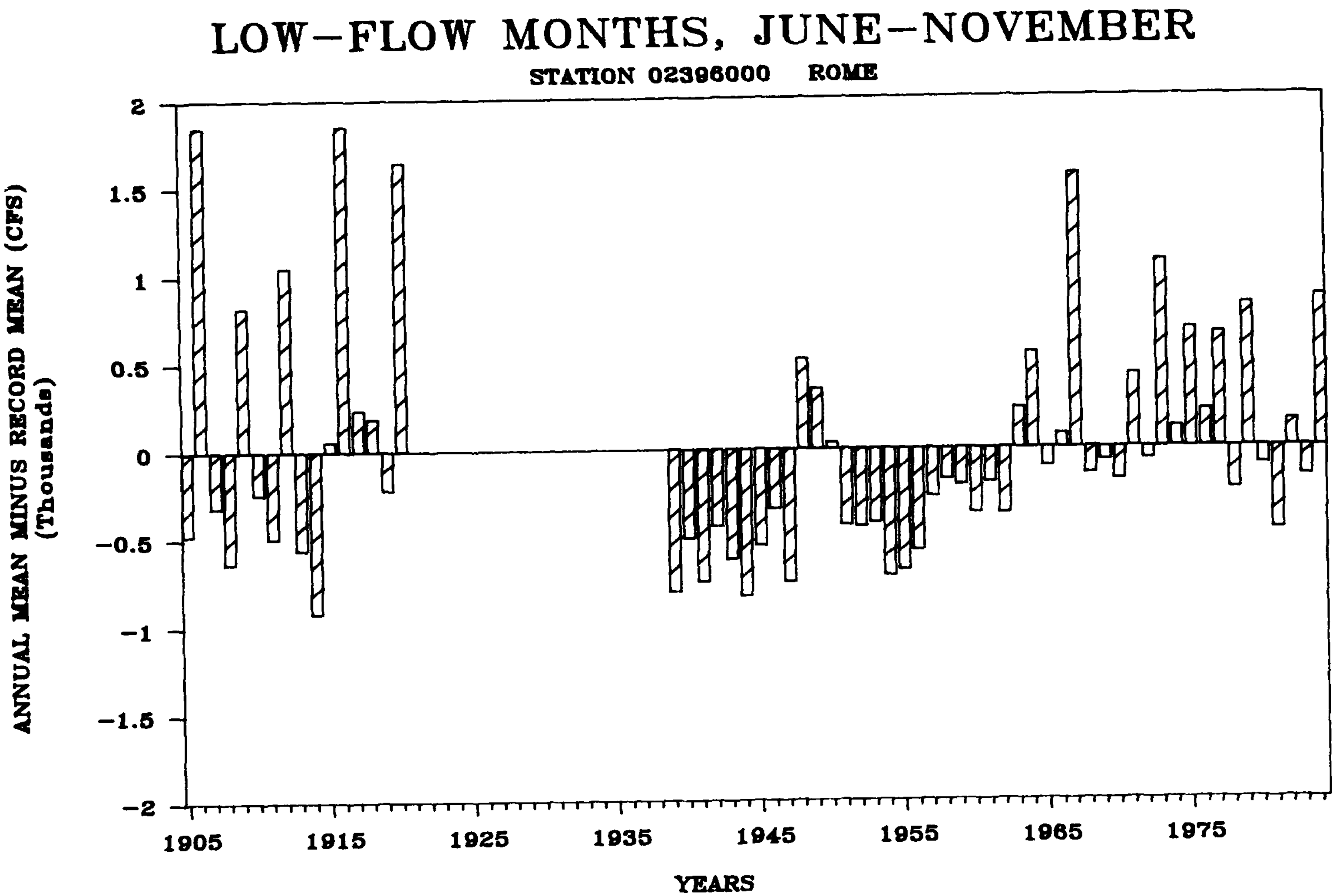
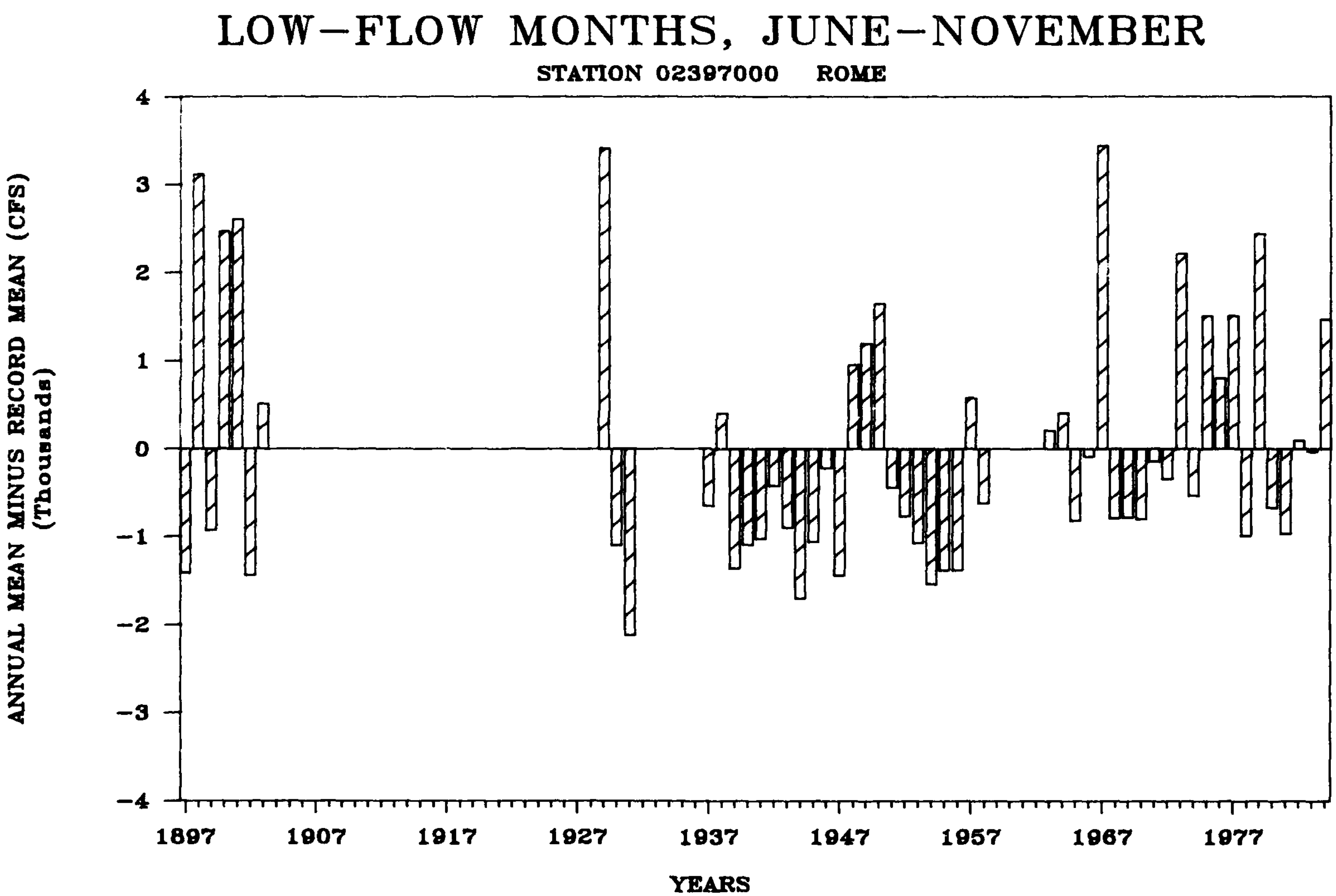
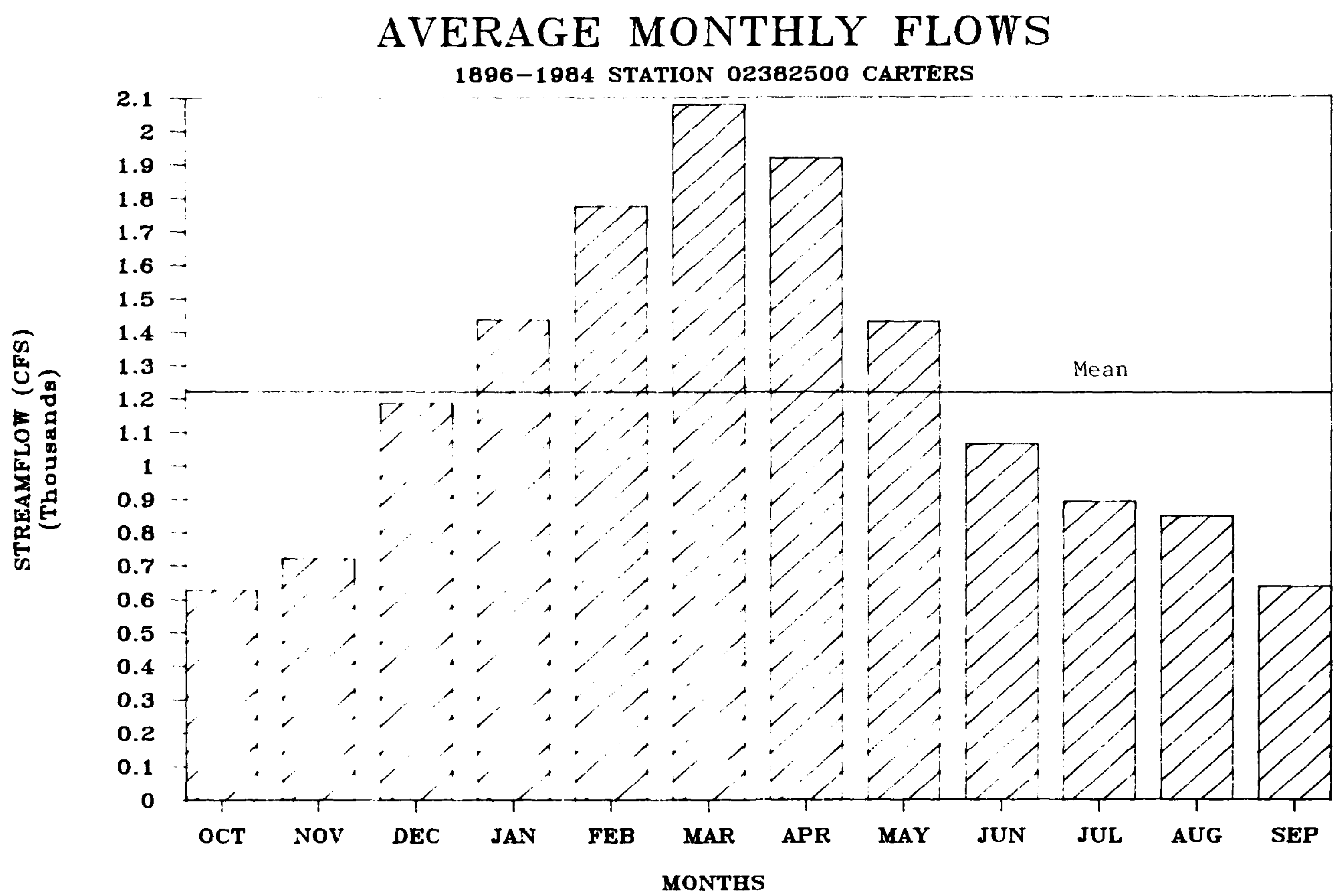

LOW-FLOW MONTHS, JUNE-NOVEMBER
STATION 02396000 ROME
ANNUAL MEAN MINUS RECORD MEAN (CFS)
(Thousands)
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
1905
1915
1925
1935
1945
1955
1965
1975
YEARS

FIGURE F-27



LOW–FLOW MONTHS, JUNE–NOVEMBER
STATION 02397000 ROME
ANNUAL MEAN MINUS RECORD MEAN (CFS)
(Thousands)
4
3
2
1
0
−1
−2
−3
−4
1897
1907
1917
1927
1937
1947
1957
1967
1977
YEARS

FIGURE F-28



AVERAGE MONTHLY FLOWS
1896–1984 STATION 02382500 CARTERS
STREAMFLOW (CFS)
(Thousands)
2.1
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Mean
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
MONTHS

FIGURE F-29

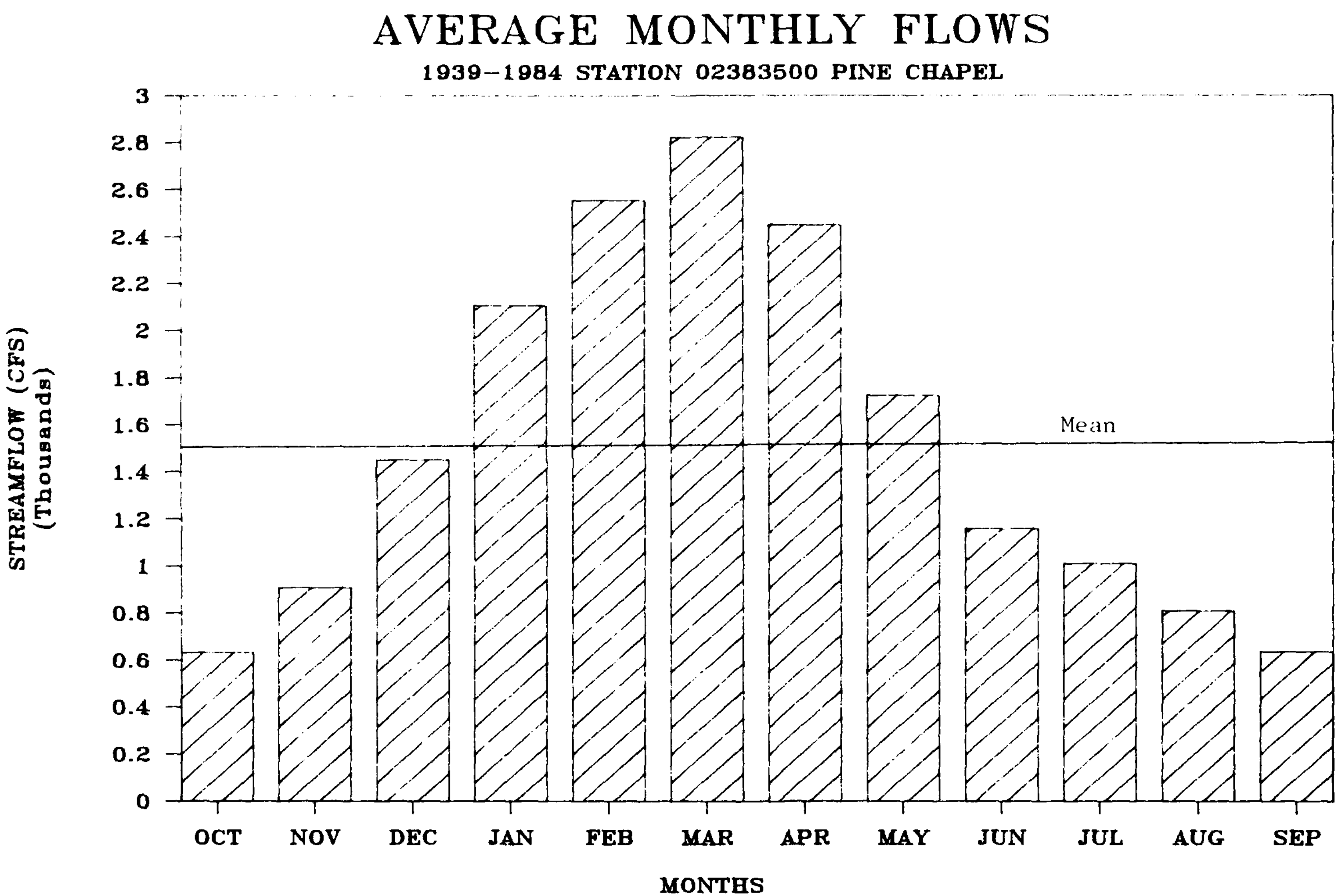

AVERAGE MONTHLY FLOWS
1939-1984 STATION 02383500 PINE CHAPEL
STREAMFLOW (CFS)
(Thousands)
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Mean
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
MONTHS

FIGURE F-30

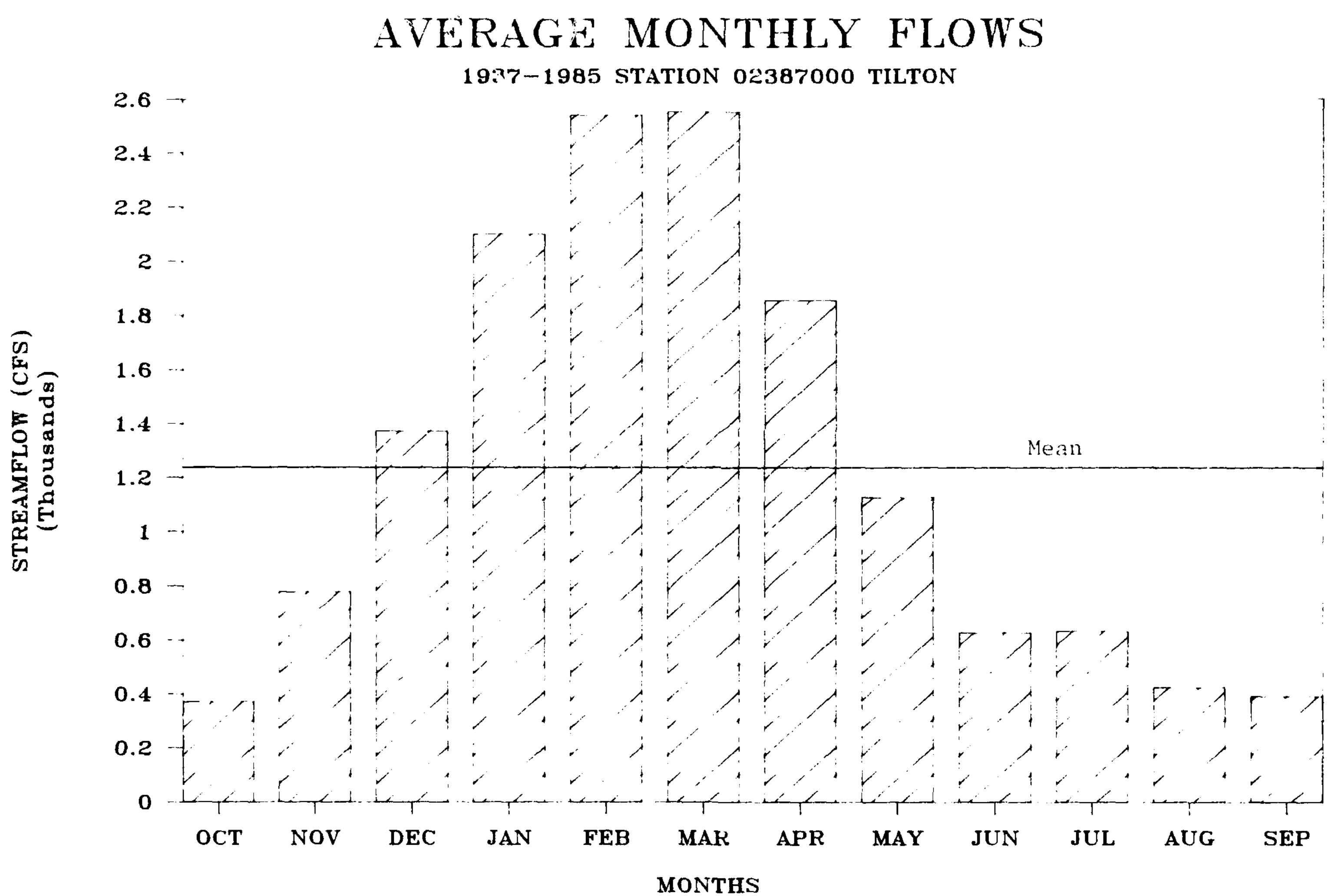

AVERAGE MONTHLY FLOWS
1937–1985 STATION 02387000 TILTON
STREAMFLOW (CFS)
(Thousands)
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Mean
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
MONTHS

FIGURE F-31

AVERAGE MONTHLY FLOWS

1893–1984 STATION 02387500 RESACA

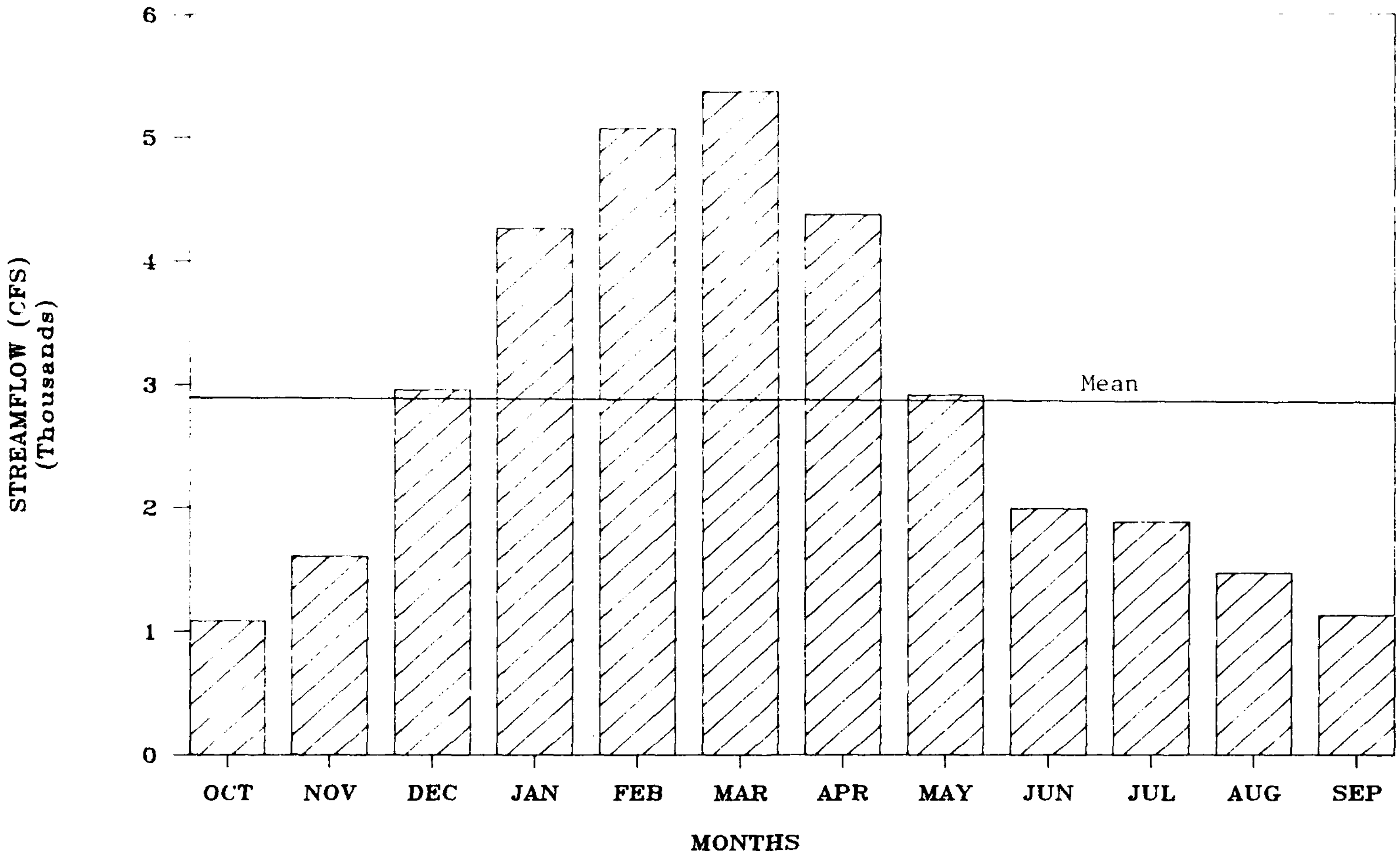


FIGURE F-32

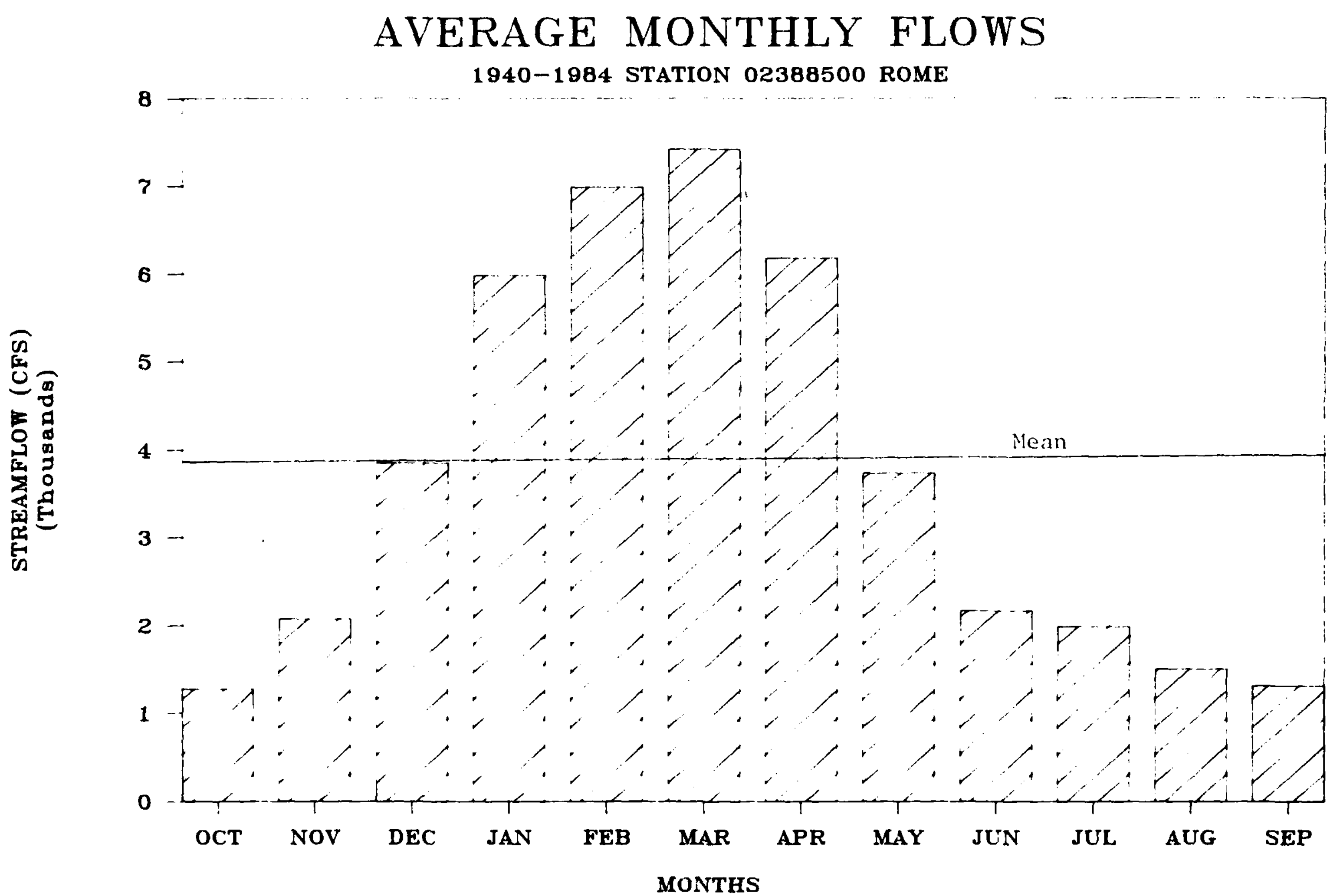

AVERAGE MONTHLY FLOWS
1940-1984 STATION 02388500 ROME
STREAMFLOW (CFS)
(Thousands)
8
7
6
5
4
3
2
1
0
Mean
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
MONTHS

FIGURE F-33

AVERAGE MONTHLY FLOWS

1904-21,1939-85 STATION 02396000 ROME

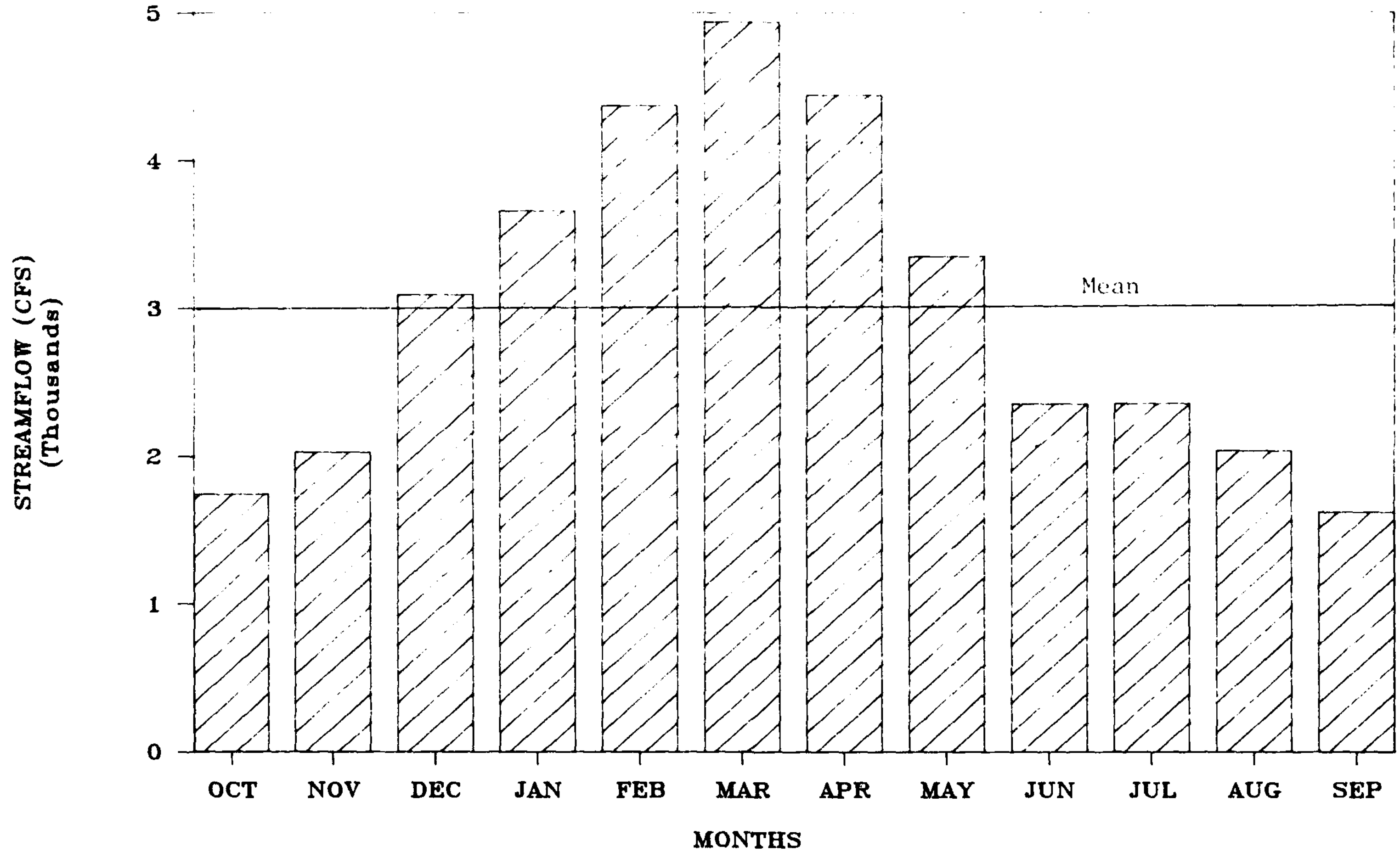


FIGURE F-34

APPENDIX G

WATER USE DATA

APPENDIX 6
USGS WATER USE DATA (MGD)

E1	E2	E3	YEAR	HYSU	USER	STREAM NAME	LATITUDE	LONGITUDE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL AVG
061	M01	01	80	1	CITY OF ELLIJAY	ELLIJAY RIVER	344122	842832	0.40	0.39	0.42	0.63	0.57	0.44	0.44	0.42	0.42	0.40	0.40	0.41	0.443
061	M01	01	81	1	CITY OF ELLIJAY	ELLIJAY RIVER	344122	842832	0.51	0.48	0.47	0.51	0.48	0.53	0.50	0.52	0.49	0.42	0.38	0.44	0.476
061	M01	01	82	1	CITY OF ELLIJAY	ELLIJAY RIVER	344122	842832	0.45	0.47	0.48	0.47	0.50	0.48	0.39	0.42	0.45	0.34	0.38	0.34	0.429
061	M01	01	83	1	CITY OF ELLIJAY	ELLIJAY RIVER	344122	842832	0.35	0.35	0.45	0.47	0.45	0.44	0.36	0.51	0.44	0.44	0.46	0.45	0.430
061	M01	01	84	1	CITY OF ELLIJAY	ELLIJAY RIVER	344122	842832	0.49	0.48	0.48	0.50	0.51	0.48	0.49	0.48	0.44	0.37	0.35	0.35	0.449
061	M01	02	80	1	CITY OF ELLIJAY	CARTECAY RIVER	344122	842832	0.49	0.54	0.59	0.57	0.41	0.54	0.53	0.55	0.57	0.42	0.47	0.47	0.511
061	M01	02	81	1	CITY OF ELLIJAY	CARTECAY RIVER	344122	842832	0.45	0.42	0.43	0.44	0.42	0.47	0.43	0.43	0.43	0.52	0.48	0.52	0.452
061	M01	02	82	1	CITY OF ELLIJAY	CARTECAY RIVER	344122	842832	0.57	0.54	0.52	0.51	0.50	0.58	0.52	0.56	0.56	0.48	0.47	0.48	0.523
061	M01	02	83	1	CITY OF ELLIJAY	CARTECAY RIVER	344122	842832	0.53	0.52	0.45	0.36	0.35	0.45	0.48	0.57	0.51	0.39	0.39	0.37	0.446
061	M01	02	84	1	CITY OF ELLIJAY	CARTECAY RIVER	344122	842832	0.39	0.38	0.36	0.35	0.35	0.38	0.35	0.43	0.34	0.37	0.39	0.32	0.366
061	M01	D1	80	2	CITY OF ELLIJAY	COOSAWATTEE RIVER	344122	842832	0.69	0.70	0.64	0.73	0.68	-0-	-0-	0.51	0.48	-0-	0.70	0.73	0.650
061	M01	D1	81	2	CITY OF ELLIJAY	COOSAWATTEE RIVER	344122	842832	0.72	1.01	1.01	0.90	0.88	0.93	0.84	0.79	0.89	0.84	0.85	0.90	0.879
061	M01	D1	82	2	CITY OF ELLIJAY	COOSAWATTEE RIVER	344122	842832	0.93	-0-	0.88	0.79	0.70	0.62	0.57	0.62	0.75	1.11	1.20	1.30	0.860
061	M01	D1	83	2	CITY OF ELLIJAY	COOSAWATTEE RIVER	344122	842832	1.30	1.02	1.13	1.08	0.79	0.99	0.95	1.18	1.19	0.98	1.04	1.24	1.074
061	M01	D1	84	2	CITY OF ELLIJAY	COOSAWATTEE RIVER	344122	842832	1.13	1.06	1.16	1.17	1.26	1.13	1.12	1.32	1.03	1.04	0.88	0.92	1.102
061	N07	01	84	2	USCE CARTERS LAKE-DOLL MT	CARTERS LAKE	343643	843706	-0-	-0-	-0-	0.00	0.00	0.00	0.00	0.00	0.00	-0-	-0-	-0-	0.001
064	I03	D1	80	2	ED LACY MILLS	SALACOA CREEK	342609	844212	0.04	0.04	0.04	0.03	0.03	0.03	0.02	0.03	0.03	0.02	0.02	0.01	0.028
064	I03	D1	81	2	ED LACY MILLS	SALACOA CREEK	342609	844212	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.04	-0-	0.01	0.016
064	I03	D1	82	2	ED LACY MILLS	SALACOA CREEK	342609	844212	0.02	0.04	0.06	0.06	0.05	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.033
064	I03	D1	83	2	ED LACY MILLS	SALACOA CREEK	342609	844212	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.031
064	I03	D1	84	2	ED LACY MILLS	SALACOA CREEK	342609	844212	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	-0-	0.028
064	I05	D1	81	2	DALTON ROCK PRODUCTS CO.	LEWIS BR-SALACOA CR	343200	844800	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.58	0.312
064	I05	D1	84	2	DALTON ROCK PRODUCTS CO.	LEWIS BR-SALACOA CR	343200	844800	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	-0-	-0-	0.016
064	M02	01	82	2	CITY OF FAIRMONT	SALACOA CREEK	342609	844212	0.20	0.14	0.14	0.14	0.14	0.13	0.14	0.16	0.16	0.17	0.17	0.17	0.153
064	M02	01	83	2	CITY OF FAIRMONT	SALACOA CREEK	342609	844212	0.16	0.19	0.19	0.21	0.19	0.15	0.14	0.18	0.16	0.17	0.18	0.18	0.173
064	M02	01	84	2	CITY OF FAIRMONT	SALACOA CREEK	342609	844212	0.17	0.18	0.17	0.17	0.16	0.21	0.14	0.21	0.21	0.22	0.18	0.15	0.180
105	I02	D1	80	3	MAJESTIC CARPETS	TRIB-TOWN BRANCH	344359	844858	0.05	0.06	0.07	0.04	0.03	-0-	-0-	-0-	0.13	0.03	0.07	0.06	0.057
105	I02	D1	81	3	MAJESTIC CARPETS	TRIB-TOWN BRANCH	344359	844858	0.06	0.08	0.10	-0-	0.09	0.12	0.01	0.07	0.12	0.15	0.04	0.11	0.066
105	I05	D1	81	3	DIXIE YARNS INC.	TOWN BRANCH	344648	844902	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.04	0.02	0.04	0.02	0.024
105	I05	D1	84	3	DIXIE YARNS INC.	TOWN BRANCH	344648	844902	0.02	0.02	0.02	0.02	0.01	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.021
105	I05	D2	84	3	DIXIE YARNS INC.	TOWN BRANCH	344652	844855	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.001

E1	E2	E3	YEAR	HYSU	USER	STREAM NAME	LATITUDE	LONGITUDE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL AVG
105	M01	01	80	3	CITY OF CHATSWORTH	HOLLY CREEK	344637	844538	0.48	0.50	0.52	0.50	0.68	0.68	0.91	0.81	0.70	0.66	0.50	0.49	0.619
105	M01	01	81	3	CITY OF CHATSWORTH	HOLLY CREEK	344637	844538	0.62	0.48	0.35	0.30	0.40	0.44	0.74	0.78	0.70	0.58	0.46	0.32	0.514
105	M01	01	82	3	CITY OF CHATSWORTH	HOLLY CREEK	344637	844538	0.35	0.33	0.32	0.34	0.33	0.45	0.43	0.67	0.66	0.72	0.43	0.31	0.445
105	M01	01	83	3	CITY OF CHATSWORTH	HOLLY CREEK	344637	844538	0.35	0.40	0.32	0.31	0.37	0.39	0.72	0.97	0.84	0.77	0.63	0.33	0.532
105	M01	01	84	3	CITY OF CHATSWORTH	HOLLY CREEK	344637	844538	0.37	0.31	0.33	0.35	0.37	0.55	0.54	0.55	0.80	0.71	0.52	0.32	0.477
105	M01	02	84	3	CITY OF CHATSWORTH	ETON SPRINGS	344623	844605	1.29	1.24	1.30	1.29	1.42	1.35	1.35	1.47	1.08	1.09	1.28	1.37	1.296
105	M01	D1	80	3	CITY OF CHATSWORTH	HOLLY CR-CONASAUGA R	343532	844528	1.31	1.23	1.35	1.19	0.97	0.69	0.71	0.60	0.60	0.58	0.61	0.41	0.854
105	M01	D1	81	3	CITY OF CHATSWORTH	HOLLY CR-CONASAUGA R	343532	844528	0.56	0.73	0.41	0.76	0.65	0.62	0.39	0.54	0.53	0.54	0.47	0.77	0.580
105	M01	D1	82	3	CITY OF CHATSWORTH	HOLLY CR-CONASAUGA R	343532	844528	0.92	1.00	0.90	0.83	0.51	0.63	0.52	0.66	0.59	0.70	0.87	0.93	0.754
105	M01	D1	83	3	CITY OF CHATSWORTH	HOLLY CR-CONASAUGA R	343532	844528	0.73	0.89	0.89	0.86	0.91	0.82	0.83	0.75	0.80	0.68	1.05	1.25	0.870
105	M01	D1	84	3	CITY OF CHATSWORTH	HOLLY CR-CONASAUGA R	343532	844528	0.96	1.03	1.11	1.13	0.92	0.68	1.04	1.07	0.93	1.02	1.05	1.11	1.004
155	I04	D1	81	3	DOW CHEMICAL-USA	CONASAUGA RIVER	343738	845515	0.02	0.03	0.03	0.03	0.03	0.02	0.02	0.04	0.03	0.03	0.02	0.02	0.024
155	I04	D1	84	3	DOW CHEMICAL-USA	CONASAUGA RIVER	343738	845515	0.05	0.04	0.03	0.03	0.05	0.05	0.05	0.35	0.02	0.09	0.04	-0-	0.073
155	I04	D2	81	3	DOW CHEMICAL-USA	CONASAUGA RIVER	343738	845515	0.00	0.02	0.03	0.06	0.03	0.06	0.05	0.07	0.07	0.03	0.01	0.05	0.039
155	I05	D1	81	3	WEST POINT PEPPERELL INC	LITTLE SWAMP CREEK	-0-	-0-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.001
155	I08	D1	81	3	DALTON ROCK PRODUCTS CO.	COAHULLA CREEK	-0-	-0-	2.88	2.88	2.88	2.88	2.88	2.88	2.88	2.88	2.88	2.88	2.88	2.88	2.880
155	I08	D1	84	3	DALTON ROCK PRODUCTS CO.	COAHULLA CREEK	-0-	-0-	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	-0-	-0-	0.026
155	I12	D2	81	3	C&J LEASING COMPANY	SWAMP CREEK	344107	845909	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.004
155	I12	D2	84	3	C&J LEASING COMPANY	SWAMP CREEK	344107	845909	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.004
155	M01	01	80	3	CITY OF DALTON	CONASAUGA RIVER	344715	845230	22.2	23.4	22.6	24.7	23.4	24.1	23.8	25.9	25.2	22.6	21.9	23.5	23.59
155	M01	01	81	3	CITY OF DALTON	CONASAUGA RIVER	344715	845230	23.1	23.9	23.7	24.3	25.2	24.8	25.9	26.4	24.5	23.0	22.1	22.1	24.00
155	M01	01	82	3	CITY OF DALTON	CONASAUGA RIVER	344715	845230	21.1	21.8	22.5	22.9	23.7	26.5	23.3	26.7	26.1	23.9	23.9	23.6	23.83
155	M01	01	83	3	CITY OF DALTON	CONASAUGA RIVER	344715	845230	23.5	24.4	25.0	24.9	26.4	29.3	25.4	31.4	28.3	26.6	26.2	24.9	26.38
155	M01	01	84	3	CITY OF DALTON	CONASAUGA RIVER	344715	845230	26.3	25.9	27.1	27.0	29.1	30.2	25.8	29.8	27.7	29.0	22.7	23.8	27.05
155	M01	03	80	3	CITY OF DALTON	MILL CREEK	344733	815839	0.31	0.32	0.26	0.21	0.18	0.18	0.22	0.30	0.31	0.35	0.27	0.24	0.261
155	M01	03	81	3	CITY OF DALTON	MILL CREEK	344733	815839	8.58	9.02	13.2	7.06	7.96	5.67	10.7	8.50	9.53	8.53	5.51	1.25	7.950
155	M01	03	82	3	CITY OF DALTON	MILL CREEK	344733	815839	2.28	5.10	5.09	4.68	5.59	5.18	6.17	3.96	5.48	6.10	5.47	6.00	5.090
155	M01	03	83	3	CITY OF DALTON	MILL CREEK	344733	815839	4.87	5.30	3.84	5.27	5.59	3.11	5.25	5.52	6.75	6.08	6.20	5.39	5.262
155	M01	03	84	3	CITY OF DALTON	MILL CREEK	344733	815839	3.33	6.91	3.40	4.00	4.52	5.68	6.58	6.67	6.88	5.05	9.03	5.76	5.632
155	M01	D1	80	3	CITY OF DALTON	DROWNING BEAR CREEK	344326	845601	22.3	19.0	15.0	16.0	16.0	17.7	16.5	19.7	17.0	17.5	15.7	18.1	17.54
155	M01	D1	81	3	CITY OF DALTON	DROWNING BEAR CREEK	344326	845601	16.4	21.0	21.8	22.9	20.0	23.0	21.1	23.8	21.4	18.2	20.3	28.2	21.51
155	M01	D1	82	3	CITY OF DALTON	DROWNING BEAR CREEK	344326	845601	24.3	23.3	20.9	21.4	21.8	21.4	13.2	19.0	18.3	19.0	21.5	25.3	20.76
155	M01	D1	83	3	CITY OF DALTON	DROWNING BEAR CREEK	344326	845601	23.5	23.5	21.7	22.6	19.8	18.2	14.5	20.0	19.4	16.2	16.7	15.4	19.26
155	M01	D1	84	3	CITY OF DALTON	DROWNING BEAR CREEK	344326	845601	14.5	17.8	16.3	20.9	22.6	17.4	20.1	22.3	17.0	16.8	18.7	18.1	18.55
155	M01	D2	80	3	CITY OF DALTON	DROWNING BEAR CREEK	344451	845731	7.30	7.30	6.70	7.10	6.00	6.00	8.60	8.60	7.50	4.50	4.60	5.00	6.600
155	M01	D2	81	3	CITY OF DALTON	DROWNING BEAR CREEK	344451	845731	6.30	5.40	5.10	5.20	5.80	6.50	6.30	5.10	5.50	5.00	4.20	3.30	5.300

E1	E2	E3	YEAR	HYSU	USER	STREAM NAME	LATITUDE	LONGITUDE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL AVG
155	M01	D2	82	3	CITY OF DALTON	DROWNING BEAR CREEK	344451	845731	5.70	4.60	5.30	4.60	5.80	3.90	4.70	4.60	4.30	4.10	3.70	5.00	4.698
155	M01	D2	83	3	CITY OF DALTON	DROWNING BEAR CREEK	344451	845731	3.70	6.10	5.10	4.60	3.90	5.30	4.60	4.30	5.20	5.10	4.50	5.30	4.796
155	M01	D2	84	3	CITY OF DALTON	DROWNING BEAR CREEK	344451	845731	5.80	5.30	5.10	5.30	4.80	4.70	5.10	5.30	5.20	5.80	3.90	4.90	5.101
008	M01	D1	80	4	CITY OF ADAIRSVILLE	OOTHKALOOGA CREEK	342225	845630	0.19	0.21	0.20	0.20	-0-	0.19	0.20	0.20	0.24	0.15	0.26	0.22	0.203
008	M01	D1	81	4	CITY OF ADAIRSVILLE	OOTHKALOOGA CREEK	342225	845630	0.22	0.20	0.22	0.15	0.22	0.17	0.21	0.20	0.19	0.19	0.20	0.20	0.198
008	M01	D1	83	4	CITY OF ADAIRSVILLE	OOTHKALOOGA CREEK	342225	845630	0.19	0.19	0.19	0.21	0.19	0.18	0.18	0.17	0.19	0.17	0.15	0.18	0.182
008	M01	D1	84	4	CITY OF ADAIRSVILLE	OOTHKALOOGA CREEK	342225	845630	0.18	0.20	0.20	0.18	0.17	0.19	0.20	0.17	0.19	0.19	0.20	0.18	0.186
057	I03	01	82	4	BURLINGTON IND-BRIGHTON	WOODWARD CREEK	342052	850555	0.35	0.41	0.35	0.43	0.39	0.34	0.34	0.43	0.33	0.38	0.36	0.31	0.368
057	I03	01	83	4	BURLINGTON IND-BRIGHTON	WOODWARD CREEK	342052	850555	0.32	0.25	0.28	0.29	0.35	0.33	0.36	0.38	0.39	0.38	0.36	0.31	0.335
057	I03	01	84	4	BURLINGTON IND-BRIGHTON	WOODWARD CREEK	342052	850555	0.29	0.29	0.29	0.44	0.49	0.46	0.39	0.31	0.31	0.31	0.23	0.28	0.342
057	M02	D1	80	4	FLOYD COUNTY WATER SYSTEM	COOSA RIVER	341301	851842	0.48	0.56	0.89	0.66	0.46	0.31	0.28	0.26	0.31	0.48	0.40	0.40	0.456
057	M02	D1	81	4	FLOYD COUNTY WATER SYSTEM	COOSA RIVER	341301	851842	0.32	0.50	0.44	0.44	0.31	0.37	0.30	0.36	0.39	0.32	0.31	0.55	0.384
057	M02	D1	82	4	FLOYD COUNTY WATER SYSTEM	COOSA RIVER	341301	851842	0.76	-0-	0.74	0.79	0.42	0.37	0.38	0.32	0.26	0.31	0.58	0.76	0.516
057	M02	D1	83	4	FLOYD COUNTY WATER SYSTEM	COOSA RIVER	341301	851842	0.61	0.71	0.72	0.76	0.57	0.49	0.31	0.25	0.31	0.33	0.29	0.67	0.500
057	M02	D1	84	4	FLOYD COUNTY WATER SYSTEM	COOSA RIVER	341301	851842	0.77	0.52	0.58	0.63	0.56	0.33	0.44	0.51	0.35	0.28	0.29	0.46	0.476
057	M02	D2	80	4	FLOYD COUNTY WATER SYSTEM	SILVER CR TRIBUTARY	341904	850625	0.39	0.47	0.58	0.45	0.33	0.48	0.56	0.59	0.31	0.30	0.36	0.24	0.421
057	M02	D2	81	4	FLOYD COUNTY WATER SYSTEM	SILVER CR TRIBUTARY	341904	850625	0.24	0.44	0.36	0.53	0.25	0.33	0.32	0.25	0.22	0.22	0.11	0.23	0.291
057	M02	D2	82	4	FLOYD COUNTY WATER SYSTEM	SILVER CR TRIBUTARY	341904	850625	0.39	0.44	0.53	0.53	0.25	0.33	0.33	0.25	0.27	0.22	0.26	0.23	0.334
057	M02	D2	83	4	FLOYD COUNTY WATER SYSTEM	SILVER CR TRIBUTARY	341904	850625	0.44	0.28	0.49	0.64	0.64	0.49	0.60	0.57	0.49	0.43	0.50	0.72	0.525
057	M02	D2	84	4	FLOYD COUNTY WATER SYSTEM	SILVER CR TRIBUTARY	341904	850625	0.70	0.76	0.79	0.77	0.83	0.60	0.59	0.80	0.54	0.56	0.56	0.63	0.677
057	M02	D3	80	4	FLOYD COUNTY WATER SYSTEM	WARD C-OOSTANAULA R	342000	850500	0.28	0.28	0.34	0.29	0.22	0.17	0.11	0.10	0.12	0.23	0.23	0.19	0.212
057	M02	D3	81	4	FLOYD COUNTY WATER SYSTEM	WARD C-OOSTANAULA R	342000	850500	0.13	0.34	0.26	0.26	0.18	0.22	0.14	0.15	0.13	-0-	0.12	0.24	0.197
057	M02	D3	82	4	FLOYD COUNTY WATER SYSTEM	WARD C-OOSTANAULA R	342000	850500	0.35	0.35	0.33	0.33	0.19	0.14	0.13	0.13	0.10	0.07	0.09	0.18	0.198
057	M02	D3	83	4	FLOYD COUNTY WATER SYSTEM	WARD C-OOSTANAULA R	342000	850500	0.17	0.22	0.20	0.25	0.21	0.23	0.15	0.13	0.15	0.15	0.17	0.33	0.196
057	M02	D3	84	4	FLOYD COUNTY WATER SYSTEM	WARD C-OOSTANAULA R	342000	850500	0.38	0.24	0.25	0.26	0.23	0.18	0.18	0.22	0.13	0.13	0.12	0.17	0.207
057	M04	01	82	4	CITY OF ROME	OOSTANAULA RIVER	341605	851026	8.65	8.32	6.52	6.59	7.72	7.43	7.70	7.77	7.56	7.39	6.80	6.30	7.396
057	M04	01	83	4	CITY OF ROME	OOSTANAULA RIVER	341605	851026	6.40	6.18	6.15	6.19	7.23	7.41	7.98	8.82	7.76	7.46	6.91	7.55	7.180
057	M04	01	84	4	CITY OF ROME	OOSTANAULA RIVER	341605	851026	7.38	7.35	7.63	7.45	7.66	8.82	8.00	8.33	8.55	8.23	7.23	7.17	7.818
064	I04	D1	80	4	GOODYEAR TIRE AND RUBBER	OOTHKALOOGA CR	342742	845628	0.11	0.11	0.29	0.16	0.17	0.05	0.07	0.14	0.11	0.07	0.04	0.04	0.110
064	I04	D1	81	4	GOODYEAR TIRE AND RUBBER	OOTHKALOOGA CR	342742	845628	0.04	0.13	0.12	0.10	0.12	0.12	0.11	0.12	0.09	0.14	0.11	0.21	0.117
064	I04	D1	82	4	GOODYEAR TIRE AND RUBBER	OOTHKALOOGA CR	342742	845628	0.09	0.23	0.13	0.10	0.07	0.10	0.07	0.09	0.06	0.07	0.14	0.09	0.099
064	I04	D1	83	4	GOODYEAR TIRE AND RUBBER	OOTHKALOOGA CR	342742	845628	0.11	0.12	0.07	0.13	0.10	0.05	0.03	0.05	0.09	0.04	0.06	0.14	0.082
064	I04	D1	84	4	GOODYEAR TIRE AND RUBBER	OOTHKALOOGA CR	342742	845628	0.16	0.10	0.14	0.08	0.09	0.06	0.11	0.17	0.08	0.13	0.09	-0-	0.100
064	M01	01	80	4	CITY OF CALHOUN	OOSTANAULA RIVER	343056	845716	7.32	7.86	7.34	7.32	7.23	7.18	7.50	8.67	8.75	9.51	9.09	8.67	8.037
064	M01	02	80	4	CITY OF CALHOUN	COOSAWATTEE RIVER	343109	845708	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.240
064	M01	02	81	4	CITY OF CALHOUN	COOSAWATTEE RIVER	343109	845708	8.29	9.40	8.64	8.65	8.36	8.73	9.02	9.05	8.38	7.99	7.44	7.42	8.450

E1	E2	E3	YEAR	HYSU	USER	STREAM NAME	LATITUDE	LONGITUDE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL AVG
064	M01	02	82	4	CITY OF CALHOUN	COOSAWATTEE RIVER	343109	845708	7.57	8.10	8.07	7.59	7.98	8.45	7.60	8.86	8.70	8.31	8.13	7.32	8.054
064	M01	02	83	4	CITY OF CALHOUN	COOSAWATTEE RIVER	343109	845708	7.51	7.93	8.22	7.88	8.53	9.17	8.25	10.8	9.82	9.85	9.20	8.94	8.845
064	M01	02	84	4	CITY OF CALHOUN	COOSAWATTEE RIVER	343109	845708	9.36	9.61	9.44	9.78	10.0	10.5	9.17	11.0	10.6	11.2	10.1	9.28	10.01
064	M01	D1	80	4	CITY OF CALHOUN	OOSTANAULA RIVER	343036	845805	4.27	5.22	7.35	6.77	5.73	4.09	3.43	4.52	4.20	4.91	4.89	4.74	5.008
064	M01	D1	81	4	CITY OF CALHOUN	OOSTANAULA RIVER	343036	845805	4.20	6.39	5.75	5.79	4.96	5.40	4.48	4.82	4.75	4.22	3.90	4.61	4.938
064	M01	D1	82	4	CITY OF CALHOUN	OOSTANAULA RIVER	343036	845805	6.41	7.50	6.18	6.06	4.95	4.68	3.46	4.73	4.47	4.65	6.55	7.24	5.580
064	M01	D1	83	4	CITY OF CALHOUN	OOSTANAULA RIVER	343036	845805	5.39	6.20	6.58	6.33	5.46	5.69	3.97	6.10	6.05	5.69	6.67	7.19	5.937
064	M01	D1	84	4	CITY OF CALHOUN	OOSTANAULA RIVER	343036	845805	6.34	6.56	7.11	7.63	7.32	6.11	5.06	6.01	5.47	5.68	5.03	5.88	6.205
064	N03	D1	80	4	DOT-SAFETY REST AREA #34	TRIB OOTHKALOOGA CR	342444	845522	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.01	0.01	0.014
064	N03	D1	81	4	DOT-SAFETY REST AREA #34	TRIB OOTHKALOOGA CR	342444	845522	0.01	0.01	0.02	0.02	-0-	-0-	0.03	0.02	0.02	0.02	0.01	0.01	0.017
064	N03	D1	84	4	DOT-SAFETY REST AREA #34	TRIB OOTHKALOOGA CR	342444	845522	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.00	0.02	0.02	0.02	0.020
093	N07	01	82	5	CAMP F D MERRILL	UPPER ETOWAH RIVER	-0-	-0-	0.05	0.06	0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.045
093	N07	01	83	5	CAMP F D MERRILL	UPPER ETOWAH RIVER	-0-	-0-	0.03	0.04	0.04	0.01	0.03	0.03	0.04	0.01	0.03	0.03	0.01	0.02	0.027
093	N07	01	84	5	CAMP F D MERRILL	UPPER ETOWAH RIVER	-0-	-0-	0.04	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.026
093	N07	D1	80	5	CAMP F D MERRILL	ETOWAH RIVER	-0-	-0-	-0-	-0-	-0-	0.01	0.01	0.01	-0-	-0-	-0-	0.00	0.00	0.00	0.009
093	N07	D1	81	5	CAMP F D MERRILL	ETOWAH RIVER	-0-	-0-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.003
093	N07	D1	82	5	CAMP F D MERRILL	ETOWAH RIVER	-0-	-0-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.001
093	N07	D2	81	5	CAMP F D MERRILL	ETOWAH RIVER	-0-	-0-	0.04	0.04	0.04	0.06	0.06	0.06	0.61	0.61	0.61	0.00	-0-	0.00	0.193
093	N07	D2	82	5	CAMP F D MERRILL	ETOWAH RIVER	-0-	-0-	0.03	0.05	0.00	-0-	-0-	0.00	0.00	-0-	-0-	0.02	0.02	0.03	0.020
093	N07	D3	80	5	CAMP F D MERRILL	ETOWAH RIVER	-0-	-0-	-0-	-0-	-0-	0.00	0.00	0.00	0.00	0.00	0.00	-0-	-0-	-0-	0.002
093	N07	D3	82	5	CAMP F D MERRILL	ETOWAH RIVER	-0-	-0-	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.003
028	I03	D1	80	6	GOLDKIST INC	ETOWAH RIVER	341809	842349	0.07	0.09	0.17	-0-	-0-	-0-	0.14	0.17	0.08	0.10	0.07	-0-	0.110
028	I03	D1	81	6	GOLDKIST INC	ETOWAH RIVER	341809	842349	0.13	0.21	0.13	0.09	0.09	0.06	0.09	0.21	0.06	0.09	0.13	0.14	0.118
028	I03	D1	84	6	GOLDKIST INC	ETOWAH RIVER	341809	842349	0.20	0.18	0.14	0.12	0.08	0.03	0.13	0.11	0.01	0.04	0.07	-0-	0.101
028	I04	01	82	6	CANTON TEXTILE MILLS	HICKORY LOG CREEK	341606	842830	0.19	0.14	0.15	0.16	0.16	0.17	0.17	-0-	0.16	0.17	0.20	0.16	0.167
028	I04	01	83	6	CANTON TEXTILE MILLS	HICKORY LOG CREEK	341606	842830	0.16	0.16	0.17	0.16	0.18	0.18	0.19	0.21	0.21	0.20	0.21	0.19	0.186
028	M02	01	82	6	CITY OF CANTON	ETOWAH RIVER	341428	842921	2.38	2.34	2.34	2.32	2.36	2.53	2.40	2.45	2.41	2.32	2.22	2.25	2.359
028	M02	01	83	6	CITY OF CANTON	ETOWAH RIVER	341428	842921	2.37	2.37	2.25	2.30	2.35	2.46	2.56	2.70	2.27	2.23	2.17	2.27	2.359
028	M02	01	84	6	CITY OF CANTON	ETOWAH RIVER	341428	842921	2.30	2.24	2.22	2.21	2.32	2.52	2.33	2.22	2.41	2.55	2.28	2.17	2.312
028	M02	D1	80	6	CITY OF CANTON	ETOWAH RIVER TRIB	341429	842933	0.18	0.03	0.29	-0-	0.03	0.02	0.26	0.24	0.29	0.50	0.46	0.41	0.246
028	M02	D1	81	6	CITY OF CANTON	ETOWAH RIVER TRIB	341429	842933	-0-	-0-	0.40	0.34	0.35	0.36	0.33	0.35	0.32	0.32	0.29	0.37	0.343
028	M02	D1	82	6	CITY OF CANTON	ETOWAH RIVER TRIB	341429	842933	0.58	0.44	0.34	0.53	0.36	0.29	0.28	0.28	0.26	0.33	0.39	0.49	0.379
028	M02	D1	83	6	CITY OF CANTON	ETOWAH RIVER TRIB	341429	842933	0.46	0.62	0.41	0.48	0.38	0.30	0.28	0.26	0.30	0.28	0.36	0.65	0.395
028	M02	D1	84	6	CITY OF CANTON	ETOWAH RIVER TRIB	341429	842933	0.47	0.43	0.42	0.57	0.63	0.40	0.81	0.55	0.42	0.39	0.46	0.50	0.505
028	M02	D2	80	6	CITY OF CANTON	ETOWAH RIVER TRIB	341354	843008	0.32	0.32	0.33	0.25	0.30	0.28	0.28	0.27	0.26	0.27	0.28	0.18	0.276
028	M02	D2	81	6	CITY OF CANTON	ETOWAH RIVER TRIB	341354	843008	0.24	0.28	0.25	0.15	0.05	0.05	0.06	0.15	0.19	0.25	0.22	0.22	0.176

E1	E2	E3	YEAR	AYSU	USER	STREAM NAME	LATITUDE	LONGITUDE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL AVG
042	M01	D1	80	6	CITY OF DAWSONVILLE	FLAT CREEK	342443	840741	0.01	0.01	0.01	0.04	0.04	0.04	0.03	0.00	0.00	0.03	0.01	0.00	0.018
042	M01	D1	81	6	CITY OF DAWSONVILLE	FLAT CREEK	342443	840741	0.04	0.03	0.05	0.04	0.03	0.04	0.01	0.04	0.03	0.01	0.03	0.04	0.032
042	M01	D1	83	6	CITY OF DAWSONVILLE	FLAT CREEK	342443	840741	0.05	0.02	0.03	0.04	0.04	0.04	0.07	0.04	0.02	0.04	0.04	-0-	0.036
042	M01	D1	84	6	CITY OF DAWSONVILLE	FLAT CREEK	342443	840741	-0-	0.09	0.09	0.02	0.01	0.02	0.04	0.05	0.05	0.04	0.04	0.07	0.042
112	I01	D1	81	6	GEORGIA MARBLE COMPANY	EAST BR LONG SWAMP C	342539	842013	0.22	0.00	0.22	0.31	0.31	0.62	0.11	0.22	0.18	0.00	0.31	0.51	0.249
112	I01	D1	82	6	GEORGIA MARBLE COMPANY	EAST BR LONG SWAMP C	342539	842013	0.84	0.00	1.01	0.84	0.84	0.62	0.40	0.40	0.31	0.40	0.84	0.84	0.615
112	I01	D2	81	6	GEORGIA MARBLE COMPANY	LONG SWAMP CREEK	342434	842201	0.00	0.00	0.06	0.06	0.06	0.15	0.06	0.07	0.00	0.00	0.06	0.13	0.052
112	I01	D3	81	6	GEORGIA MARBLE COMPANY	SHARP MOUNTAIN CREEK	342240	842341	0.00	0.00	0.15	0.41	0.41	0.41	0.09	0.15	0.15	0.00	0.07	0.49	0.195
112	M01	01	82	6	CITY OF JASPER	LONG SWAMP CREEK	342803	842353	-0-	-0-	-0-	-0-	0.71	0.74	0.74	0.79	0.79	0.71	0.73	0.77	0.747
112	M01	01	83	6	CITY OF JASPER	LONG SWAMP CREEK	342803	842353	0.71	0.65	0.64	0.54	0.71	0.69	0.76	0.73	0.66	0.77	0.85	0.91	0.717
112	M01	D1	80	6	CITY OF JASPER	HAMMONDS CREEK	342700	842600	-0-	-0-	-0-	-0-	0.08	-0-	0.08	0.08	0.02	0.13	0.01	0.10	0.068
112	M01	D1	81	6	CITY OF JASPER	HAMMONDS CREEK	342700	842600	-0-	0.08	0.13	0.11	0.09	0.10	0.10	0.08	0.13	0.11	0.10	0.11	0.102
112	M01	D1	83	6	CITY OF JASPER	HAMMONDS CREEK	342700	842600	-0-	0.11	0.11	0.11	0.11	0.11	0.12	0.10	0.08	0.08	0.08	0.07	0.097
112	M01	D1	84	6	CITY OF JASPER	HAMMONDS CREEK	342700	842600	0.06	0.05	0.07	0.06	0.04	0.05	0.06	0.07	0.05	0.05	0.07	0.05	0.055
112	M01	D2	80	6	CITY OF JASPER	TOWN CR (POLECAT CR)	342700	842600	-0-	-0-	-0-	-0-	0.20	-0-	0.20	0.03	0.10	0.13	0.01	0.13	0.113
112	M01	D2	81	6	CITY OF JASPER	TOWN CR (POLECAT CR)	342700	842600	0.16	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.13	0.11	0.11	0.046
112	M01	D2	83	6	CITY OF JASPER	TOWN CR (POLECAT CR)	342700	842600	0.10	0.12	0.11	0.11	0.11	0.12	0.10	0.09	0.07	0.07	-0-	0.08	0.097
112	M01	D2	84	6	CITY OF JASPER	TOWN CR (POLECAT CR)	342700	842600	0.07	0.09	0.06	0.08	0.07	0.07	0.07	0.09	0.06	0.09	0.09	0.07	0.075
008	M02	01	82	7	CITY OF CARTERSVILLE	LAKE ALLATOONNA	340953	844344	5.14	5.09	5.16	5.23	5.67	5.72	5.46	6.43	6.25	5.75	5.57	4.55	5.383
008	M02	01	83	7	CITY OF CARTERSVILLE	LAKE ALLATOONNA	340953	844344	4.53	5.34	5.47	5.56	5.24	6.11	6.38	6.84	6.01	5.83	5.64	5.47	5.701
028	I01	D1	83	7	CENTRAL SOYA OF ATHENS	BLANKETS CREEK	341131	843008	0.69	0.89	0.71	0.69	0.71	0.71	0.70	0.77	0.71	0.65	0.60	0.57	0.698
028	I01	D1	84	7	CENTRAL SOYA OF ATHENS	BLANKETS CREEK	341131	843008	0.58	0.55	0.55	0.60	0.73	0.75	0.63	0.61	0.45	0.54	-0-	-0-	0.598
028	M03	D1	80	7	CITY OF WOODSTOCK	RUBES CREEK	340554	843045	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.031
028	M03	D1	81	7	CITY OF WOODSTOCK	RUBES CREEK	340554	843045	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.03	-0-	0.02	0.03	0.028
028	M03	D1	83	7	CITY OF WOODSTOCK	RUBES CREEK	340554	843045	-0-	-0-	0.10	0.09	0.03	0.07	0.03	0.05	0.02	0.11	0.09	0.12	0.070
028	M03	D1	84	7	CITY OF WOODSTOCK	RUBES CREEK	340554	843045	0.07	0.12	0.12	0.05	0.06	0.05	0.05	0.00	-0-	0.05	0.06	0.10	0.060
033	I01	D1	80	7	VULCAN MATERIALS CO	NOONDAY CR	-0-	-0-	0.00	0.00	1.10	0.00	1.63	0.00	0.00	0.00	1.99	0.00	0.00	0.00	0.393
033	I01	D1	81	7	VULCAN MATERIALS CO	NOONDAY CR	-0-	-0-	0.00	3.60	0.00	0.30	0.10	0.03	0.00	0.00	0.05	0.01	0.00	1.63	0.476
033	M01	01	80	7	COBB CO MARIETTA WAT AUTH	LAKE ALLATOONA	340546	844234	23.0	23.5	24.4	25.1	30.1	31.5	34.8	31.8	30.5	25.8	21.1	22.2	26.98
033	M01	01	81	7	COBB CO MARIETTA WAT AUTH	LAKE ALLATOONA	340546	844234	21.5	21.3	22.4	27.3	25.8	32.0	34.2	27.3	26.6	27.7	22.0	19.3	25.64
033	M01	01	82	7	COBB CO MARIETTA WAT AUTH	LAKE ALLATOONA	340546	844234	18.1	19.3	18.6	15.4	20.6	23.6	24.2	22.6	21.7	20.2	20.6	19.4	20.36
033	M01	01	83	7	COBB CO MARIETTA WAT AUTH	LAKE ALLATOONA	340546	844234	20.8	20.7	21.2	21.2	23.5	30.2	33.0	32.7	28.7	27.8	22.8	23.9	25.59
033	M01	01	84	7	COBB CO MARIETTA WAT AUTH	LAKE ALLATOONA	340546	844234	23.4	22.8	22.2	25.2	28.8	35.6	29.7	31.8	34.5	33.5	30.9	26.6	28.77
033	M02	D3	80	7	COBB CO MARIETTA WAT AUTH	NOONDAY CREEK	340405	843210	0.04	0.03	0.01	0.07	0.03	0.03	0.04	0.03	0.05	0.04	0.01	0.04	0.034
033	M02	D3	81	7	COBB CO MARIETTA WAT AUTH	NOONDAY CREEK	340405	843210	0.03	0.03	0.03	0.03	0.02	0.02	0.02	-0-	-0-	-0-	-0-	-0-	0.025
033	M02	D3	83	7	COBB CO MARIETTA WAT AUTH	NOONDAY CREEK	340405	843210	0.04	0.04	0.06	0.04	0.05	0.04	0.03	0.03	0.02	0.02	0.04	0.04	0.037

E1	E2	E3	YEAR	HYSU	USER	STREAM NAME	LATITUDE	LONGITUDE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL AVG
033	M02	D3	84	7	COBB CO MARIETTA WAT AUTH	NOONDAY CREEK	340405	843210	0.06	0.06	0.03	0.06	0.04	0.03	0.03	0.03	0.03	0.03	0.02	0.04	0.037
033	M02	D4	80	7	COBB CO MARIETTA WAT AUTH	NOONDAY CREEK	340405	843210	0.47	0.48	0.54	0.52	0.51	0.38	0.32	0.31	0.33	0.37	0.36	0.32	0.410
033	M02	D4	81	7	COBB CO MARIETTA WAT AUTH	NOONDAY CREEK	340405	843210	0.32	0.36	0.34	0.32	0.34	0.31	0.29	-0-	-0-	-0-	-0-	-0-	0.323
033	M02	D6	80	7	COBB CO MARIETTA WAT AUTH	NOONDAY CREEK	340419	843213	1.76	1.54	1.32	1.58	1.39	1.48	1.04	2.18	1.96	1.51	1.57	1.53	1.572
033	M02	D6	81	7	COBB CO MARIETTA WAT AUTH	NOONDAY CREEK	340419	843213	1.46	1.73	1.69	1.78	1.53	1.74	1.40	-0-	-0-	-0-	-0-	-0-	1.619
033	M02	D6	82	7	COBB CO MARIETTA WAT AUTH	NOONDAY CREEK	340419	843213	1.88	1.22	2.09	2.01	2.11	2.00	1.87	1.90	1.60	1.75	2.80	3.80	2.092
033	M02	D6	83	7	COBB CO MARIETTA WAT AUTH	NOONDAY CREEK	340419	843213	3.14	3.40	3.40	3.50	3.30	3.22	3.00	2.90	3.40	2.30	2.50	3.80	3.152
033	M02	D6	84	7	COBB CO MARIETTA WAT AUTH	NOONDAY CREEK	340419	843213	3.40	4.30	4.20	4.80	4.50	3.30	4.10	4.60	3.30	3.20	3.20	4.30	3.933
033	M02	D9	80	7	COBB CO MARIETTA WAT AUTH	BUTLER CREEK	340229	843839	0.02	0.04	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.01	0.01	0.015
033	M02	D9	81	7	COBB CO MARIETTA WAT AUTH	BUTLER CREEK	340229	843839	0.01	0.01	0.01	0.01	0.01	0.03	0.02	-0-	-0-	-0-	-0-	-0-	0.014
033	M02	D9	83	7	COBB CO MARIETTA WAT AUTH	BUTLER CREEK	340229	843839	0.05	0.07	0.05	0.05	0.05	0.06	0.01	0.01	0.03	0.03	0.03	0.03	0.038
033	M02	D9	84	7	COBB CO MARIETTA WAT AUTH	BUTLER CREEK	340229	843839	0.02	0.03	0.03	0.01	0.04	0.01	0.02	0.03	0.04	0.02	0.02	0.03	0.024
033	M02	E4	80	7	COBB CO MARIETTA WAT AUTH	BUTLER CREEK	340218	843929	0.00	0.01	0.02	-0-	0.01	0.01	0.01	-0-	0.01	0.01	0.01	0.01	0.009
033	M02	E4	81	7	COBB CO MARIETTA WAT AUTH	BUTLER CREEK	340218	843929	0.01	-0-	0.01	0.02	0.01	0.01	0.01	0.01	-0-	-0-	-0-	-0-	0.010
033	M02	E4	83	7	COBB CO MARIETTA WAT AUTH	BUTLER CREEK	340218	843929	0.01	0.06	0.16	0.16	0.00	0.00	0.01	0.01	0.01	0.02	0.01	0.16	0.050
033	M02	E4	84	7	COBB CO MARIETTA WAT AUTH	BUTLER CREEK	340218	843929	0.01	0.01	0.04	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.09	0.017
033	M03	D1	80	7	CITY OF ACWORTH	TANYARD CREEK	340500	844119	0.48	0.39	0.61	0.49	0.44	0.41	0.35	0.38	0.41	0.41	0.35	0.35	0.423
033	M03	D1	81	7	CITY OF ACWORTH	TANYARD CREEK	340500	844119	0.33	0.44	0.43	0.42	0.42	0.42	0.36	0.41	0.43	0.39	0.39	0.44	0.406
033	M03	D1	82	7	CITY OF ACWORTH	TANYARD CREEK	340500	844119	0.47	0.49	0.43	0.50	0.41	0.40	0.42	0.43	0.39	0.42	0.43	0.51	0.442
033	M03	D1	83	7	CITY OF ACWORTH	TANYARD CREEK	340500	844119	0.44	0.45	0.48	0.50	0.47	0.42	0.37	0.39	0.30	0.36	0.54	0.58	0.440
033	M03	D1	84	7	CITY OF ACWORTH	TANYARD CREEK	340500	844119	0.54	0.46	0.45	0.44	0.48	0.43	0.48	0.51	0.44	0.46	0.43	0.46	0.464
060	M05	D4	80	7	FULTON COUNTY	LITTLE RIVER	340624	842528	0.13	0.12	0.22	0.20	0.16	0.16	0.10	0.08	0.11	0.12	0.11	0.10	0.133
060	M05	D4	81	7	FULTON COUNTY	LITTLE RIVER	340624	842528	0.09	0.09	0.07	0.10	0.13	0.12	0.09	0.09	0.09	0.11	0.13	0.12	0.102
060	M05	D4	82	7	FULTON COUNTY	LITTLE RIVER	340624	842528	0.15	0.26	0.08	0.12	0.16	0.14	0.15	0.14	0.14	-0-	0.17	-0-	0.149
060	M05	D4	83	7	FULTON COUNTY	LITTLE RIVER	340624	842528	-0-	-0-	-0-	-0-	-0-	0.16	0.13	0.13	0.16	0.10	0.11	0.23	0.145
060	M05	D4	84	7	FULTON COUNTY	LITTLE RIVER	340624	842528	0.11	0.13	0.17	0.19	0.22	0.19	0.22	0.25	0.11	0.10	0.10	0.11	0.157
008	I01	D2	80	8	THOMPSON WIENMAN COMPANY	ETOWAH RIVER	340800	844700	0.34	-0-	-0-	-0-	-0-	-0-	0.34	0.39	0.39	0.39	0.24	0.30	0.341
008	I01	D2	81	8	THOMPSON WIENMAN COMPANY	ETOWAH RIVER	340800	844700	-0-	0.49	0.49	-0-	0.39	-0-	0.49	0.49	-0-	-0-	-0-	0.59	0.4[illegible]
008	I01	D2	83	8	THOMPSON WIENMAN COMPANY	ETOWAH RIVER	340800	844700	0.82	0.82	0.82	0.82	0.82	-0-	0.82	-0-	0.89	0.89	0.00	0.00	0.6[illegible]
008	I01	D2	84	8	THOMPSON WIENMAN COMPANY	ETOWAH RIVER	340800	844700	0.00	0.00	1.10	1.10	1.10	1.00	0.90	1.00	0.89	0.97	0.92	0.90	0.828
008	I05	D1	80	8	NEW RIVERSIDE OCHRE CO	ETOWAH RIVER	340941	844540	1.12	1.11	1.20	1.19	1.45	1.37	0.72	1.11	1.20	1.04	1.20	1.20	1.159
008	I05	D1	81	8	NEW RIVERSIDE OCHRE CO	ETOWAH RIVER	340941	844540	0.72	1.20	1.20	1.20	1.97	1.62	1.19	1.93	1.46	1.81	1.73	2.39	1.535
008	I05	D1	82	8	NEW RIVERSIDE OCHRE CO	ETOWAH RIVER	340941	844540	3.33	2.04	0.89	2.38	1.62	1.20	1.23	1.05	0.88	1.26	1.14	1.03	1.500
008	I05	D1	83	8	NEW RIVERSIDE OCHRE CO	ETOWAH RIVER	340941	844540	1.35	1.25	1.11	1.11	0.75	1.07	1.15	1.15	1.13	1.22	1.20	3.79	1.360
008	I05	D1	84	8	NEW RIVERSIDE OCHRE CO	ETOWAH RIVER	340941	844540	1.35	1.40	1.40	1.26	1.06	0.83	1.73	2.03	0.63	0.98	1.26	-0-	1.268
008	I06	D1	81	8	CHEMICAL PRODUCTS CORP.	ETOWAH RIVER	340828	844707	0.99	1.02	1.01	0.99	0.97	0.95	0.92	0.93	0.92	0.99	0.99	1.01	0.973

E1	E2	E3	YEAR	-YSU	USER	STREAM NAME	LATITUDE	LONGITUDE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL AVG
008	I06	D1	84	8	CHEMICAL PRODUCTS CORP.	ETOWAH RIVER	340828	844707	0.97	0.94	0.93	0.94	1.08	1.10	0.91	1.02	1.08	1.12	-0-	-0-	1.009
008	I07	D1	80	8	GOODYEAR TIRE AND RUBBER	PETTIT CREEK	341025	844858	0.13	0.13	0.14	0.13	0.13	0.13	0.12	0.10	0.10	0.12	0.13	0.12	0.122
008	I07	D1	81	8	GOODYEAR TIRE AND RUBBER	PETTIT CREEK	341025	844858	0.13	0.11	0.10	0.13	0.13	0.12	0.13	0.12	0.12	0.13	0.10	0.07	0.115
008	I07	D1	82	8	GOODYEAR TIRE AND RUBBER	PETTIT CREEK	341025	844858	0.13	0.13	0.13	0.13	0.13	0.07	0.05	0.05	0.07	0.09	0.13	0.10	0.099
008	I07	D1	83	8	GOODYEAR TIRE AND RUBBER	PETTIT CREEK	341025	844858	0.11	0.10	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.124
008	I07	D1	84	8	GOODYEAR TIRE AND RUBBER	PETTIT CREEK	341025	844858	0.13	0.13	0.13	0.13	0.14	0.13	0.13	0.13	0.13	0.16	-0-	-0-	0.133
008	I09	D1	80	8	CRITERION MILLS INC.	ETOWAH RIVER	340907	844615	0.00	0.00	-0-	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.006
008	I09	D1	81	8	CRITERION MILLS INC.	ETOWAH RIVER	340907	844615	0.01	0.01	0.01	0.01	0.01	-0-	0.01	0.00	0.01	0.01	0.01	0.01	0.006
008	M02	D1	80	8	CITY OF CARTERSVILLE	ETOWAH RIVER	340831	844948	3.80	3.90	5.70	4.50	4.10	3.80	3.30	3.70	3.80	4.10	3.80	3.10	3.966
008	M02	D1	81	8	CITY OF CARTERSVILLE	ETOWAH RIVER	340831	844948	2.90	4.20	3.60	3.40	3.00	3.20	3.10	3.30	2.90	3.00	3.10	3.30	3.250
008	M02	D1	82	8	CITY OF CARTERSVILLE	ETOWAH RIVER	340831	844948	3.90	5.00	4.20	4.90	4.40	3.60	3.20	3.50	3.30	3.20	3.20	4.90	3.900
008	M02	D1	83	8	CITY OF CARTERSVILLE	ETOWAH RIVER	340831	844948	3.80	4.60	4.50	5.20	4.10	3.90	3.30	4.00	4.00	3.70	4.30	5.50	4.237
008	M02	D1	84	8	CITY OF CARTERSVILLE	ETOWAH RIVER	340831	844948	5.20	5.20	5.30	5.00	5.40	4.00	4.20	4.10	3.30	3.50	3.40	3.30	4.322
008	M05	D1	81	8	CITY OF EMERSON	PUMKINVINE CREEK	340655	844531	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.009
008	M05	D1	84	8	CITY OF EMERSON	PUMKINVINE CREEK	340655	844531	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.03	0.00	-0-	0.00	0.00	0.006
008	M06	D1	80	8	BARTOW CO WATER SYSTEM	PETTIT CREEK	341532	844657	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.049
008	M06	D1	81	8	BARTOW CO WATER SYSTEM	PETTIT CREEK	341532	844657	0.05	-0-	0.05	0.05	0.05	0.05	-0-	-0-	-0-	0.05	0.05	-0-	0.047
008	M06	D1	83	8	BARTOW CO WATER SYSTEM	PETTIT CREEK	341532	844657	0.10	0.05	-0-	0.05	0.05	0.05	0.05	0.07	0.07	0.05	0.07	0.05	0.056
008	M06	D1	84	8	BARTOW CO WATER SYSTEM	PETTIT CREEK	341532	844657	0.05	0.05	0.05	0.05	0.05	0.05	0.00	0.05	0.05	-0-	-0-	-0-	0.039
008	M06	D2	80	8	BARTOW CO WATER SYSTEM	TWO RUN CREEK	341657	844930	0.04	0.04	-0-	-0-	-0-	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.044
008	M06	D2	81	8	BARTOW CO WATER SYSTEM	TWO RUN CREEK	341657	844930	0.04	-0-	0.04	0.04	0.04	0.04	-0-	-0-	-0-	0.05	0.05	-0-	0.044
008	M06	D2	83	8	BARTOW CO WATER SYSTEM	TWO RUN CREEK	341657	844930	0.05	-0-	-0-	0.05	0.05	0.05	0.05	0.07	0.07	0.07	0.05	0.07	0.054
008	M06	D2	84	8	BARTOW CO WATER SYSTEM	TWO RUN CREEK	341657	844930	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	-0-	-0-	-0-	0.069
008	T01	01	82	8	GA POWER-PLANT BOWEN	ETOWAH RIVER	340808	845527	43.0	30.0	42.0	57.0	50.0	61.0	70.0	49.0	52.0	44.0	47.0	46.0	49.00
008	T01	01	83	8	GA POWER-PLANT BOWEN	ETOWAH RIVER	340808	845527	58.0	54.0	54.0	37.0	45.0	62.0	68.0	92.0	57.0	57.0	52.0	48.0	41.00
008	T01	01	84	8	GA POWER-PLANT BOWEN	ETOWAH RIVER	340808	845527	29.0	43.0	39.0	42.0	45.0	65.0	80.0	81.0	60.0	55.0	44.0	51.0	52.90
110	M01	D1	80	8	CITY OF DALLAS	WEAVER CREEK	335559	845009	0.33	0.30	0.43	0.35	0.30	0.24	0.23	-0-	0.28	0.27	0.23	0.22	0.228
110	M01	D1	81	8	CITY OF DALLAS	WEAVER CREEK	335559	845009	0.23	0.32	0.29	0.25	0.22	0.26	-0-	0.23	0.24	0.19	0.20	-0-	0.243
110	M01	D1	83	8	CITY OF DALLAS	WEAVER CREEK	335559	845009	0.28	0.31	0.30	-0-	0.33	0.27	0.22	0.24	0.25	0.24	0.20	0.33	0.268
110	M01	D1	84	8	CITY OF DALLAS	WEAVER CREEK	335559	845009	0.32	0.32	0.33	0.30	0.27	0.25	0.25	0.28	0.25	0.22	0.23	0.25	0.272
110	M01	D2	84	8	CITY OF DALLAS	LAWRENCE CREEK	335500	845000	0.05	0.04	0.04	0.06	0.11	0.06	0.02	0.08	0.00	0.03	0.03	0.05	0.048
115	I02	D1	80	8	MARQUETTE CEMENT CO	TRIB-EUHARLEE CR	340047	850257	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.104
115	I02	D1	81	8	MARQUETTE CEMENT CO	TRIB-EUHARLEE CR	340047	850257	0.10	0.10	0.10	0.10	0.10	0.10	-0-	0.10	0.10	0.10	-0-	-0-	0.104
115	I02	D2	80	8	MARQUETTE CEMENT CO	TRIB-EUHARLEE CR	340047	850257	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.06	0.08	0.088
115	I02	D2	81	8	MARQUETTE CEMENT CO	TRIB-EUHARLEE CR	340047	850257	0.08	0.08	0.08	0.08	0.08	0.08	-0-	0.08	0.08	0.08	-0-	-0-	0.080
115	I07	D1	80	8	GOODYEAR TIRE AND RUBBER	TRIB-EUHARLEE CR	335956	850302	0.23	0.14	0.15	0.17	0.24	0.18	0.18	0.25	0.18	0.14	0.11	0.08	0.170

E1	E2	E3	YEAR	HYSU	USER	STREAM NAME	LATITUDE	LONGITUDE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL AVG
115	I07	D1	81	8	GOODYEAR TIRE AND RUBBER	TRIB-EUHARLEE CR	335956	850302	0.09	0.15	0.17	0.15	0.26	0.19	0.13	0.34	0.16	0.11	0.23	0.27	0.179
115	I07	D1	82	8	GOODYEAR TIRE AND RUBBER	TRIB-EUHARLEE CR	335956	850302	0.06	0.17	0.18	0.16	0.13	0.14	0.15	0.10	0.15	0.14	0.18	0.15	0.142
115	I07	D1	83	8	GOODYEAR TIRE AND RUBBER	TRIB-EUHARLEE CR	335956	850302	0.19	0.14	0.14	0.21	0.16	0.07	0.18	0.21	[illegible]	0.16	0.07	0.18	0.155
115	I07	D1	84	8	GOODYEAR TIRE AND RUBBER	TRIB-EUHARLEE CR	335956	850302	0.11	0.11	0.15	0.17	0.11	0.12	0.29	0.13	0.17	0.06	0.18	-0-	0.145
115	M02	D1	80	8	POLK CO WATER AUTHORITY	EUHARLEE CREEK	340255	850333	0.08	0.09	-0-	0.06	0.11	0.04	0.03	0.06	0.08	0.01	0.04	0.05	0.059
115	M02	D1	81	8	POLK CO WATER AUTHORITY	EUHARLEE CREEK	340255	850333	0.09	0.10	0.08	0.07	0.07	0.07	0.07	0.08	0.08	0.07	0.07	0.07	0.074
115	M02	D1	83	8	POLK CO WATER AUTHORITY	EUHARLEE CREEK	340255	850333	0.08	0.08	0.09	0.06	0.09	0.08	-0-	0.07	0.10	0.07	0.08	0.10	0.076
115	M02	D1	84	8	POLK CO WATER AUTHORITY	EUHARLEE CREEK	340255	850333	0.09	0.09	0.09	0.10	0.09	0.08	0.09	0.09	0.07	0.06	0.06	0.07	0.081
115	M03	01	82	8	CITY OF ROCKMART	EUHARLEE CREEK	335934	850336	0.84	0.84	0.69	0.71	0.73	0.81	0.82	0.79	0.80	0.80	0.83	0.70	0.779
115	M03	01	83	8	CITY OF ROCKMART	EUHARLEE CREEK	335934	850336	0.78	0.87	0.83	0.89	1.01	1.01	1.15	1.18	0.86	1.11	1.04	1.18	0.993
115	M03	01	84	8	CITY OF ROCKMART	EUHARLEE CREEK	335934	850336	1.04	1.08	0.78	0.75	0.80	0.93	0.89	0.91	0.84	0.92	0.92	0.83	0.890
115	M03	D1	80	8	CITY OF ROCKMART	EUHARLEE CREEK	340054	850306	1.00	1.40	1.90	1.50	1.30	1.40	0.80	0.74	0.80	0.93	0.76	0.66	1.099
115	M03	D1	81	8	CITY OF ROCKMART	EUHARLEE CREEK	340054	850306	0.67	1.10	0.94	0.99	0.78	0.77	0.66	0.78	0.95	0.77	0.66	0.79	0.820
115	M03	D1	82	8	CITY OF ROCKMART	EUHARLEE CREEK	340054	850306	1.30	1.50	1.20	1.30	1.30	1.00	0.76	0.67	0.64	0.72	0.81	1.50	1.100
115	M03	D1	83	8	CITY OF ROCKMART	EUHARLEE CREEK	340054	850306	1.20	1.50	1.40	1.40	1.10	0.97	0.75	0.71	0.73	0.63	0.78	1.60	1.060
115	M03	D1	84	8	CITY OF ROCKMART	EUHARLEE CREEK	340054	850306	1.40	1.30	1.30	1.50	1.50	0.98	0.90	1.00	0.87	0.74	0.69	0.80	1.080
057	I04	01	82	9	GA KRAFT CO KRANNERT DIV.	COOSA RIVER	341458	852016	20.2	22.6	22.7	20.9	21.8	22.6	22.3	21.5	20.3	20.2	19.2	19.5	21.17
057	I04	01	83	9	GA KRAFT CO KRANNERT DIV.	COOSA RIVER	341458	852016	19.8	19.6	20.5	21.5	21.9	22.1	22.5	22.4	21.7	22.1	21.8	22.1	21.51
057	I04	01	84	9	GA KRAFT CO KRANNERT DIV.	COOSA RIVER	341458	852016	13.0	13.8	14.7	14.7	15.2	15.3	17.6	18.1	17.2	17.3	17.4	-0-	15.86
057	I05	01	82	9	WEST POINT PEPPERELL INC	SILVER CREEK	341116	851046	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.800
057	I05	01	83	9	WEST POINT PEPPERELL INC	SILVER CREEK	341116	851046	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.200
057	I05	01	84	9	WEST POINT PEPPERELL INC	SILVER CREEK	341116	851046	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.200
057	I05	D1	80	9	WEST POINT PEPPERELL INC	SILVER CREEK	341142	851136	0.24	0.25	0.26	0.27	0.28	0.27	0.23	0.28	0.30	0.30	0.25	0.24	0.264
057	I05	D1	81	9	WEST POINT PEPPERELL INC	SILVER CREEK	341142	851136	0.21	0.18	-0-	0.29	0.30	0.34	0.37	0.30	0.25	0.30	0.29	0.39	0.292
057	I05	D1	84	9	WEST POINT PEPPERELL INC	SILVER CREEK	341142	851136	0.48	0.42	0.46	0.36	0.40	0.41	0.45	0.55	0.42	0.58	0.55	0.36	0.451
057	I05	D2	80	9	WEST POINT PEPPERELL INC	SILVER CREEK	341114	851035	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.187
057	I05	D2	81	9	WEST POINT PEPPERELL INC	SILVER CREEK	341114	851035	0.19	0.19	-0-	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.187
057	I05	D2	84	9	WEST POINT PEPPERELL INC	SILVER CREEK	341114	851035	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.200
057	I07	D1	81	9	GE COMPANY	HORSELEY CR-COOSA R	341636	851331	0.00	0.10	0.10	0.08	0.05	0.14	0.08	0.38	0.20	0.10	0.01	0.09	0.110
057	I07	D2	81	9	GE COMPANY	L DRY CR-OOSTANAULA	341705	851312	0.01	0.58	0.13	0.38	0.06	0.10	0.25	0.60	0.27	0.06	0.01	0.10	0.213
057	I07	D3	81	9	GE COMPANY	HORSELEY CR-COOSA R	341645	851330	0.01	0.24	0.14	0.35	0.09	0.29	0.19	0.49	0.48	0.12	0.02	0.14	0.211
057	I07	D4	81	9	GE COMPANY	TRIB-OOSTANAULA R	341645	851303	0.01	0.20	0.09	0.12	0.03	0.15	0.30	0.66	0.17	0.14	0.01	0.17	0.169
057	I11	D1	84	9	FLORIDA ROCK INDUSTRIES	TRIB-LITTLE CRY CR	341744	851153	0.00	0.00	0.43	0.96	0.43	-0-	0.43	-0-	0.86	0.00	0.00	0.00	0.259
057	I12	D1	81	9	ALCAN BUILDING PRODUCTS	PRENTISS CREEK	341052	851121	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.016
057	I12	D1	83	9	ALCAN BUILDING PRODUCTS	PRENTISS CREEK	341052	851121	0.26	0.17	0.26	0.21	0.19	0.21	0.28	0.22	0.16	0.11	0.24	0.22	0.209
057	I12	D1	84	9	ALCAN BUILDING PRODUCTS	PRENTISS CREEK	341052	851121	0.21	0.20	0.10	0.27	0.38	0.80	0.46	0.58	0.33	0.00	0.00	0.00	0.276

E1	E2	E3	YEAR	HYSU	USER	STREAM NAME	LATITUDE	LONGITUDE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL AVG
057	M01	D1	80	9	CITY OF CAVE SPRING	CEDAR CREEK TRIB.	340708	852006	0.33	0.34	0.39	0.43	0.29	0.30	0.22	0.30	0.26	0.27	0.25	0.21	0.299
057	M01	D1	81	9	CITY OF CAVE SPRING	CEDAR CREEK TRIB.	340708	852006	0.25	0.35	-0-	-0-	-0-	-0-	-0-	0.37	0.34	0.36	0.33	0.41	0.345
057	M01	D1	83	9	CITY OF CAVE SPRING	CEDAR CREEK TRIB.	340708	852006	0.36	0.43	0.42	0.49	0.47	0.43	0.30	0.28	0.30	0.25	0.30	0.43	0.370
057	M01	D1	84	9	CITY OF CAVE SPRING	CEDAR CREEK TRIB.	340708	852006	0.47	0.44	-0-	0.58	0.62	0.52	0.47	0.70	0.47	0.44	0.35	0.43	0.456
057	M03	01	82	9	BERRY SCHOOLS	POSSUM TROT RES	341928	851612	0.34	0.32	0.29	0.28	0.29	0.31	0.29	0.34	0.35	0.37	0.34	0.25	0.314
057	M03	01	83	9	BERRY SCHOOLS	POSSUM TROT RES	341928	851612	0.31	0.32	0.30	0.30	0.33	0.31	0.33	0.40	0.44	0.39	0.38	0.30	0.340
057	M03	01	84	9	BERRY SCHOOLS	POSSUM TROT RES	341928	851612	0.37	0.35	0.33	0.30	0.33	0.30	0.27	0.26	0.37	0.31	0.31	0.14	0.303
057	M04	D1	80	9	CITY OF ROME	COOSA RIVER	341351	851148	13.7	12.4	18.1	14.8	11.1	7.38	6.36	6.62	7.14	8.88	8.36	8.07	10.24
057	M04	D1	81	9	CITY OF ROME	COOSA RIVER	341351	851148	7.66	13.0	11.9	12.4	9.34	9.22	7.04	-0-	5.98	6.02	5.91	8.14	8.776
057	M04	D1	82	9	CITY OF ROME	COOSA RIVER	341351	851148	12.1	13.7	9.63	13.3	12.8	7.90	7.96	6.72	6.54	6.39	10.4	14.7	10.20
057	M04	D1	83	9	CITY OF ROME	COOSA RIVER	341351	851148	13.6	13.3	13.8	10.5	8.72	5.76	4.12	4.23	4.94	4.89	7.52	14.1	8.774
057	M04	D1	84	9	CITY OF ROME	COOSA RIVER	341351	851148	12.3	10.7	11.1	11.6	12.5	5.86	7.48	8.53	5.08	6.02	6.52	7.22	8.738
057	T01	01	82	9	GA POWER-HAMMOND THERM PL	COOSA RIVER	341455	852055	449.	448.	369.	158.	314.	495.	524.	527.	462.	493.	425.	313.	415.0
057	T01	01	83	9	GA POWER-HAMMOND THERM PL	COOSA RIVER	341455	852055	245.	262.	270.	198.	250.	310.	418.	434.	368.	340.	344.	329.	314.5
057	T01	01	84	9	GA POWER-HAMMOND THERM PL	COOSA RIVER	341455	852055	435.	448.	474.	402.	506.	508.	514.	503.	510.	447.	412.	290.	454.1
115	I01	D1	81	9	DIAMOND SHAMROCK CO	B CEDAR C&B SP CR	340045	850302	0.79	0.77	0.71	0.56	0.68	0.71	0.69	0.70	0.71	0.65	0.63	0.58	0.682
115	I01	D1	84	9	DIAMOND SHAMROCK CO	B CEDAR C&B SP CK	340045	850302	0.43	0.37	0.32	0.33	0.32	0.36	0.46	0.43	0.35	0.32	0.26	0.28	0.351
115	I04	D1	81	9	ALTON BOX BOARD CO	BIG SP BR-CEDAR CR	340041	851600	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.004
115	I04	D1	83	9	ALTON BOX BOARD CO	BIG SP BR-CEDAR CR	340041	851600	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.002
115	I04	D1	84	9	ALTON BOX BOARD CO	BIG SP BR-CEDAR CR	340041	851600	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0-	0.00	0.00	-0-	-0-	0.002
115	M01	D1	80	9	CITY OF CEDARTOWN	CEDAR CREEK	340149	851604	1.90	2.00	1.86	1.94	1.64	1.70	1.60	1.40	1.30	1.40	1.35	1.60	1.640
115	M01	D1	81	9	CITY OF CEDARTOWN	CEDAR CREEK	340149	851604	1.20	1.60	1.33	1.50	1.60	1.10	0.84	0.78	0.81	0.75	-0-	-0-	1.019
115	M01	D1	82	9	CITY OF CEDARTOWN	CEDAR CREEK	340149	851604	-0-	1.48	1.57	1.76	-0-	1.39	1.33	1.18	1.24	1.25	1.44	1.78	1.440
115	M01	D1	83	9	CITY OF CEDARTOWN	CEDAR CREEK	340149	851604	1.60	1.65	1.75	1.50	1.70	1.20	1.10	1.30	1.10	0.90	0.90	1.60	1.357
115	M01	D1	84	9	CITY OF CEDARTOWN	CEDAR CREEK	340149	851604	1.10	1.60	1.40	1.50	1.40	1.30	-0-	-0-	1.02	1.00	1.00	1.30	1.060
027	I01	D3	80	10	RIEGEL TEXTILE CORP.	TRIB TO CHATTOOGA RI	343236	851812	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.70	0.70	0.00	0.116
027	I01	D3	81	10	RIEGEL TEXTILE CORP.	TRIB TO CHATTOOGA RI	343236	851812	0.70	0.49	0.43	0.00	0.46	0.46	0.00	0.00	0.00	0.00	0.00	0.00	0.212
027	I02	D1	80	10	HARRIET&HENDERSON COT MIL	RACCOON CREEK	342701	852309	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.004
027	I02	D1	81	10	HARRIET&HENDERSON COT MIL	RACCOON CREEK	342701	852309	0.00	0.00	0.00	0.00	0.00	0.00	-0-	-0-	-0-	0.00	0.00	0.00	0.004
027	I04	01	82	10	BIGELOW SANFORD IN-LYERLY	RACCOON CREEK	342609	852239	0.86	1.00	0.77	0.89	1.00	1.03	1.08	1.05	0.80	0.78	0.81	0.81	0.908
027	I04	01	83	10	BIGELOW SANFORD IN-LYERLY	RACCOON CREEK	342609	852239	-0-	0.67	0.68	0.69	0.83	0.95	1.10	0.87	0.84	0.92	0.94	1.01	0.866
027	I04	D1	80	10	BIGELOW SANFORD IN-LYERLY	CHATTOOGA RIVER	342455	852333	0.77	0.68	0.78	0.76	0.76	0.72	0.77	0.82	0.97	0.95	0.80	0.72	0.792
027	I04	D1	81	10	BIGELOW SANFORD IN-LYERLY	CHATTOOGA RIVER	342455	852333	0.77	0.88	0.92	0.64	0.21	0.33	0.32	0.28	0.20	0.22	0.22	0.26	0.436
027	I04	D1	84	10	BIGELOW SANFORD IN-LYERLY	CHATTOOGA RIVER	342455	852333	0.23	0.20	0.25	0.28	0.30	0.23	0.19	0.20	0.27	0.33	0.40	0.40	0.272
027	I04	D2	80	10	BIGELOW SANFORD IN-LYERLY	CHATTOOGA RIVER	342455	852333	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.360
027	I04	D2	81	10	BIGELOW SANFORD IN-LYERLY	CHATTOOGA RIVER	342455	852333	0.36	0.46	0.46	0.43	0.43	0.43	0.00	0.36	0.54	0.55	0.63	0.74	0.448

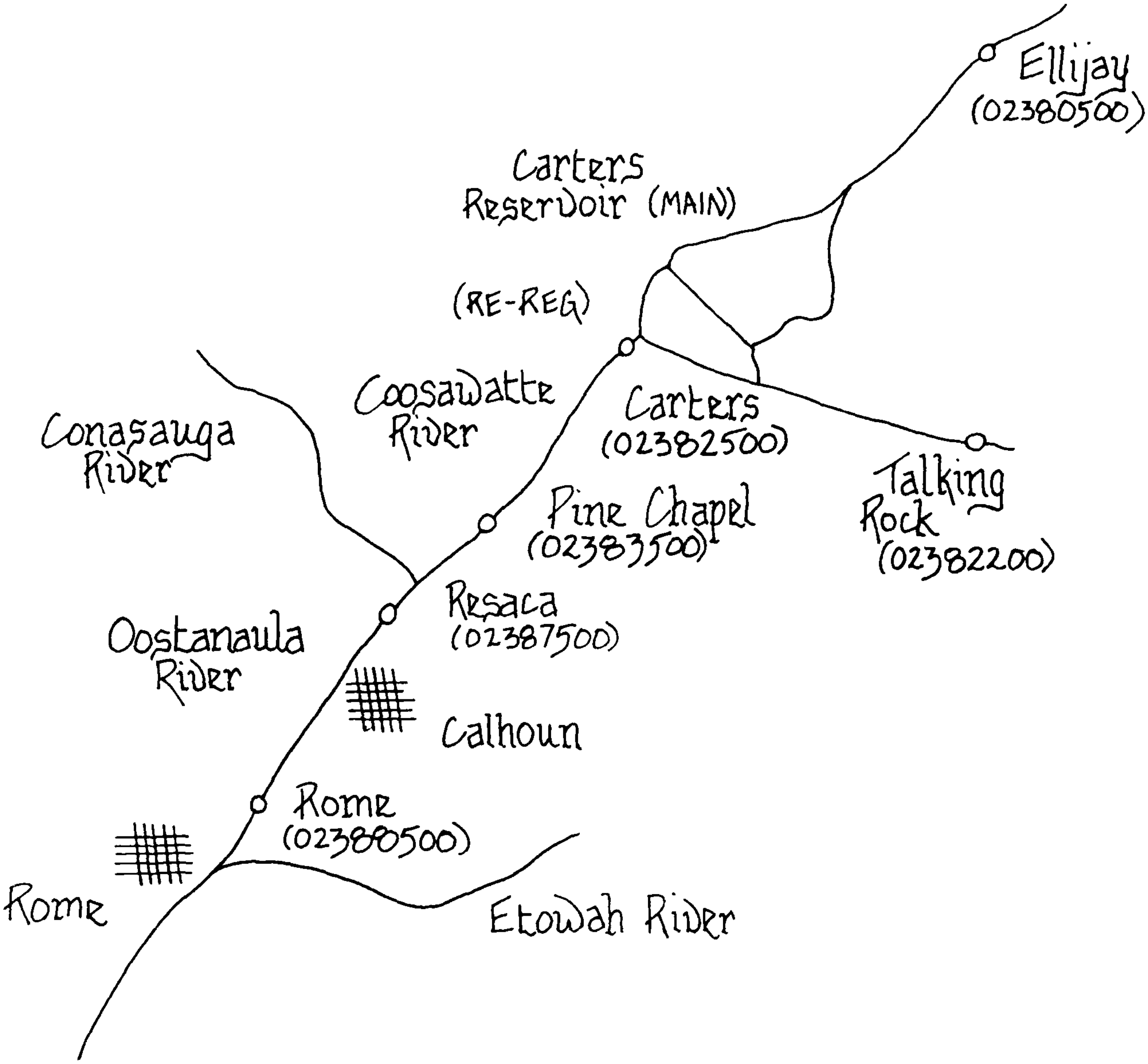
E1	E2	E3	YEAR	-YSU	USER	STREAM NAME	LATITUDE	LONGITUDE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL AVG
027	I04	D2	84	10	BIGELOW SANFORD IN-LYERLY	CHATTOOGA RIVER	342455	852333	0.14	0.21	0.17	0.14	0.14	0.14	0.14	0.14	0.17	0.17	0.14	0.17	0.154
027	M04	D1	80	10	CITY OF SUMMERVILLE	CHATTOOGA RIVER TRIB	342749	852033	2.20	2.30	2.90	3.30	2.60	1.70	1.60	1.60	1.80	1.90	1.80	1.80	2.125
027	M04	D1	81	10	CITY OF SUMMERVILLE	CHATTOOGA RIVER TRIB	342749	852033	1.80	2.70	2.00	3.20	2.10	2.00	1.70	1.90	2.00	2.00	1.50	2.10	2.083
027	M04	D1	82	10	CITY OF SUMMERVILLE	CHATTOOGA RIVER TRIB	342749	852033	2.20	2.50	2.10	2.60	2.30	1.80	1.50	1.80	1.70	1.60	1.80	2.30	2.000
027	M04	D1	83	10	CITY OF SUMMERVILLE	CHATTOOGA RIVER TRIB	342749	852033	1.90	1.50	1.70	1.80	1.70	1.80	1.60	1.80	1.70	1.80	2.00	2.00	1.776
027	M04	D1	84	10	CITY OF SUMMERVILLE	CHATTOOGA RIVER TRIB	342749	852033	2.00	1.90	2.00	2.30	2.20	2.10	2.10	2.40	1.90	1.90	1.80	1.90	2.043
027	M05	D1	80	10	TOWN OF TRION	CHATTOOGA RIVER TRIB	343209	851824	3.10	3.30	3.40	3.20	3.20	2.60	2.50	3.20	2.70	2.60	2.38	2.20	2.865
027	M05	D1	81	10	TOWN OF TRION	CHATTOOGA RIVER TRIB	343209	851824	2.70	3.20	2.60	3.00	2.60	2.60	1.80	2.80	2.90	2.20	2.40	2.40	2.691
027	M05	D1	82	10	TOWN OF TRION	CHATTOOGA RIVER TRIB	343209	851824	3.10	3.30	4.20	4.00	3.90	2.50	3.60	3.40	3.30	3.30	3.90	3.80	3.500
027	M05	D1	83	10	TOWN OF TRION	CHATTOOGA RIVER TRIB	343209	851824	3.44	4.56	4.12	3.50	3.30	3.48	2.08	3.18	3.20	3.30	4.00	3.70	3.478
027	M05	D1	84	10	TOWN OF TRION	CHATTOOGA RIVER TRIB	343209	851824	3.32	3.69	3.94	4.10	4.03	3.38	3.34	4.14	3.70	3.23	2.92	2.49	3.521
146	I12	D1	80	10	ROPER CORP	TRIB-CHATTOOGA CR	344022	851759	0.07	0.07	0.07	0.06	0.06	0.06	0.08	0.07	0.06	0.06	0.07	0.06	0.065
146	I12	D1	81	10	ROPER CORP	TRIB-CHATTOOGA CR	344022	851759	0.06	0.06	0.06	0.06	0.09	0.08	0.07	0.07	0.07	0.07	0.07	0.06	0.068
146	I12	D1	82	10	ROPER CORP	TRIB-CHATTOOGA CR	344022	851759	0.07	0.06	0.07	0.06	0.07	0.07	0.07	0.18	0.13	0.13	0.25	0.20	0.113
146	I12	D1	83	10	ROPER CORP	TRIB-CHATTOOGA CR	344022	851759	0.22	0.26	0.25	-0-	0.25	0.25	0.25	0.23	0.24	0.27	0.25	0.25	0.247
146	I12	D1	84	10	ROPER CORP	TRIB-CHATTOOGA CR	344022	851759	0.25	0.24	0.24	0.10	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.101
146	M03	02	80	10	CITY OF LAFAYETTE	DRY CREEK	344204	851843	0.49	0.50	0.50	0.52	0.51	0.51	0.47	0.48	0.51	-0-	0.52	-0-	0.500
146	M03	02	81	10	CITY OF LAFAYETTE	DRY CREEK	344204	851843	0.51	0.50	0.00	0.00	0.32	0.35	0.50	0.48	0.27	0.32	0.49	0.39	0.371
146	M03	02	82	10	CITY OF LAFAYETTE	DRY CREEK	344204	851843	0.51	0.51	0.60	0.46	0.51	0.45	0.26	0.27	0.43	-0-	0.27	0.25	0.410
146	M03	02	83	10	CITY OF LAFAYETTE	DRY CREEK	344204	851843	0.25	0.26	0.25	0.36	0.38	0.41	0.53	0.74	0.81	0.88	0.81	0.75	0.537
146	M03	02	84	10	CITY OF LAFAYETTE	DRY CREEK	344204	851843	0.86	0.91	0.86	0.78	0.88	0.71	0.81	0.83	0.72	0.96	0.79	0.83	0.829
146	M03	D1	80	10	CITY OF LAFAYETTE	CHATTOOGA CREEK	344149	851709	2.83	3.03	3.93	3.06	2.93	2.12	1.50	1.76	2.00	1.34	1.51	1.23	2.268
146	M03	D1	81	10	CITY OF LAFAYETTE	CHATTOOGA CREEK	344149	851709	1.26	2.60	1.90	1.83	1.47	1.88	-0-	2.07	1.82	1.79	2.03	2.52	1.925
146	M03	D1	82	10	CITY OF LAFAYETTE	CHATTOOGA CREEK	344149	851709	3.12	3.18	2.22	2.21	1.81	1.71	1.67	1.72	1.56	1.63	2.37	3.10	2.200
146	M03	D1	83	10	CITY OF LAFAYETTE	CHATTOOGA CREEK	344149	851709	2.52	2.89	2.45	2.84	2.67	2.11	1.84	1.95	1.91	1.88	2.60	4.11	2.477
146	M03	D1	84	10	CITY OF LAFAYETTE	CHATTOOGA CREEK	344149	851709	3.67	3.36	3.27	3.37	3.78	2.57	3.02	3.38	2.39	2.77	1.87	1.55	2.917
146	N05	D1	80	10	DOR-WALKER COUNTY PRISON	CRAWFISH CREEK	344826	851543	0.00	0.06	0.05	0.05	-0-	0.06	0.04	0.04	-0-	0.04	0.04	0.04	0.041
146	N05	D1	81	10	DOR-WALKER COUNTY PRISON	CRAWFISH CREEK	344826	851543	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	-0-	0.038
146	N05	D1	84	10	DOR-WALKER COUNTY PRISON	CRAWFISH CREEK	344826	851543	0.45	0.04	-0-	0.05	0.05	0.40	0.04	0.30	-0-	0.38	0.30	0.04	0.171

APPENDIX H

ANALYSIS OF ALTERNATIVE SUPPLY

APPENDIX H

ANALYSIS OF ALTERNATIVE SUPPLY



LOCATION MAP

FIGURE H-1

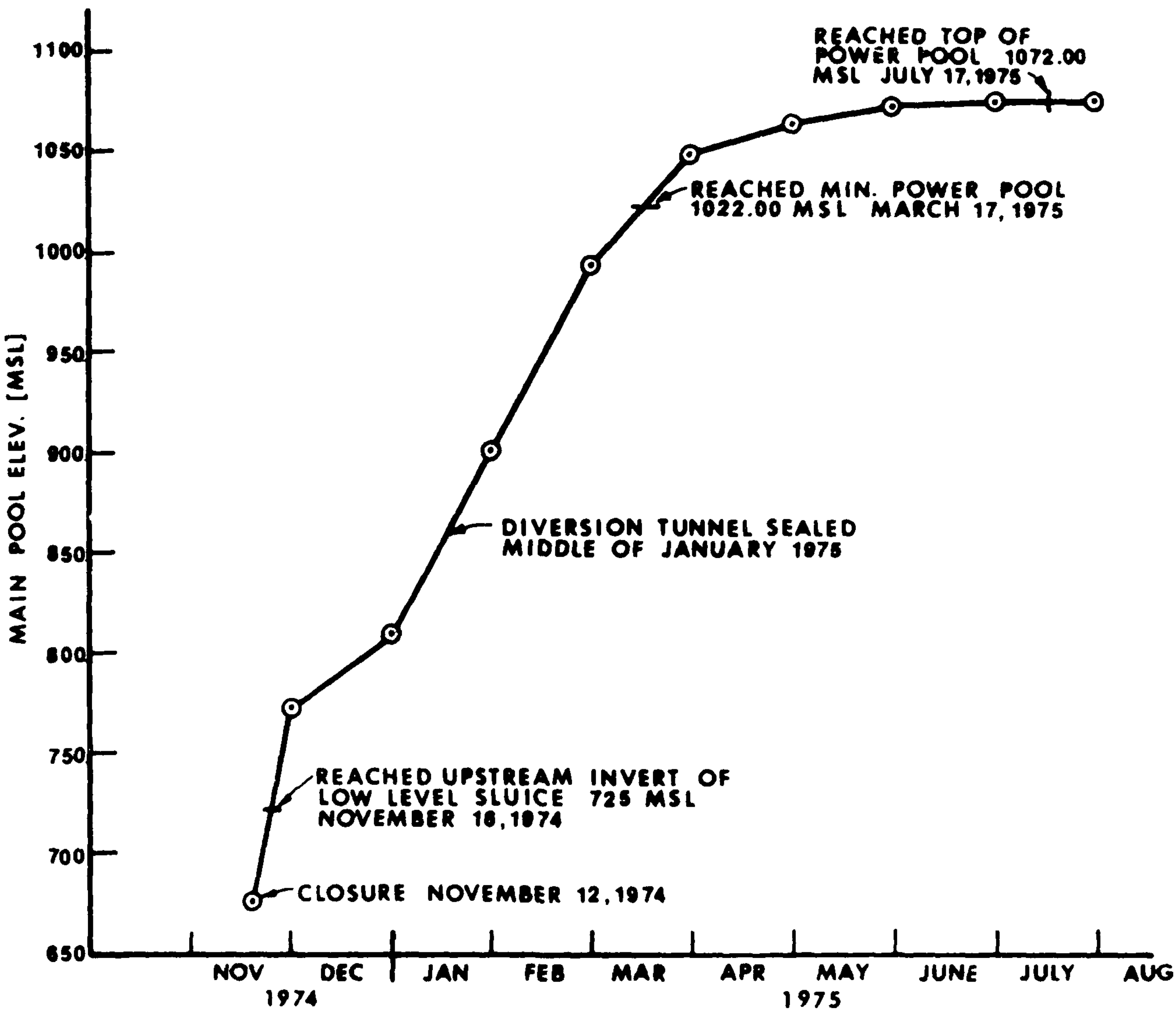

REACHED TOP OF POWER POOL 1072.00 MSL JULY 17, 1975
REACHED MIN. POWER POOL 1022.00 MSL MARCH 17, 1975
DIVERSION TUNNEL SEALED MIDDLE OF JANUARY 1975
REACHED UPSTREAM INVERT OF LOW LEVEL SLUICE 725 MSL NOVEMBER 16, 1974
CLOSURE NOVEMBER 12, 1974
MAIN POOL ELEV. [MSL]
1100
1050
1000
950
900
850
800
750
700
650
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUNE
JULY
AUG
1974
1975

FIGURE H-2

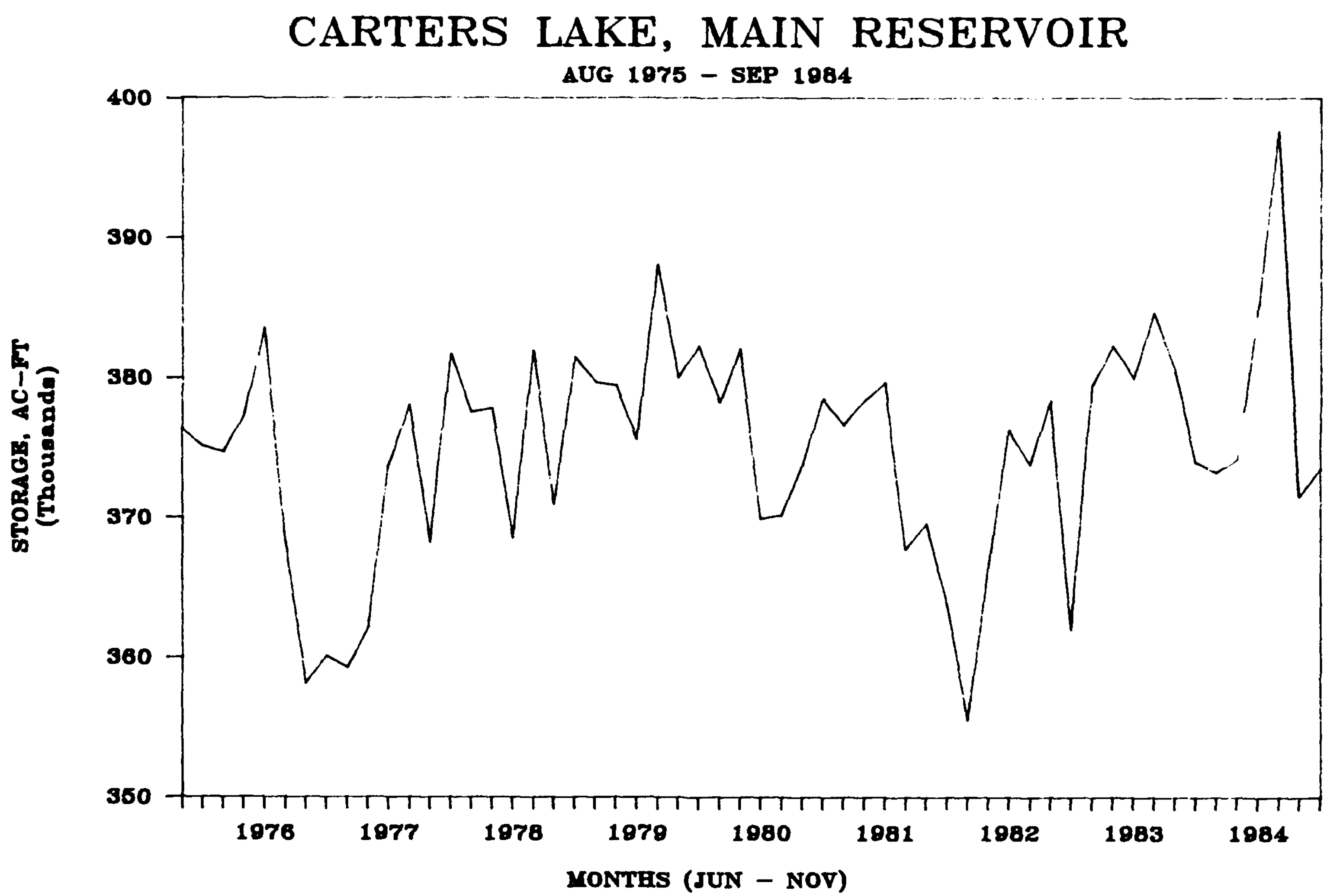

CARTERS LAKE, MAIN RESERVOIR
AUG 1975 – SEP 1984
STORAGE, AC–FT
(Thousands)
400
390
380
370
360
350
1976
1977
1978
1979
1980
1981
1982
1983
1984
MONTHS (JUN – NOV)

FIGURE H-3

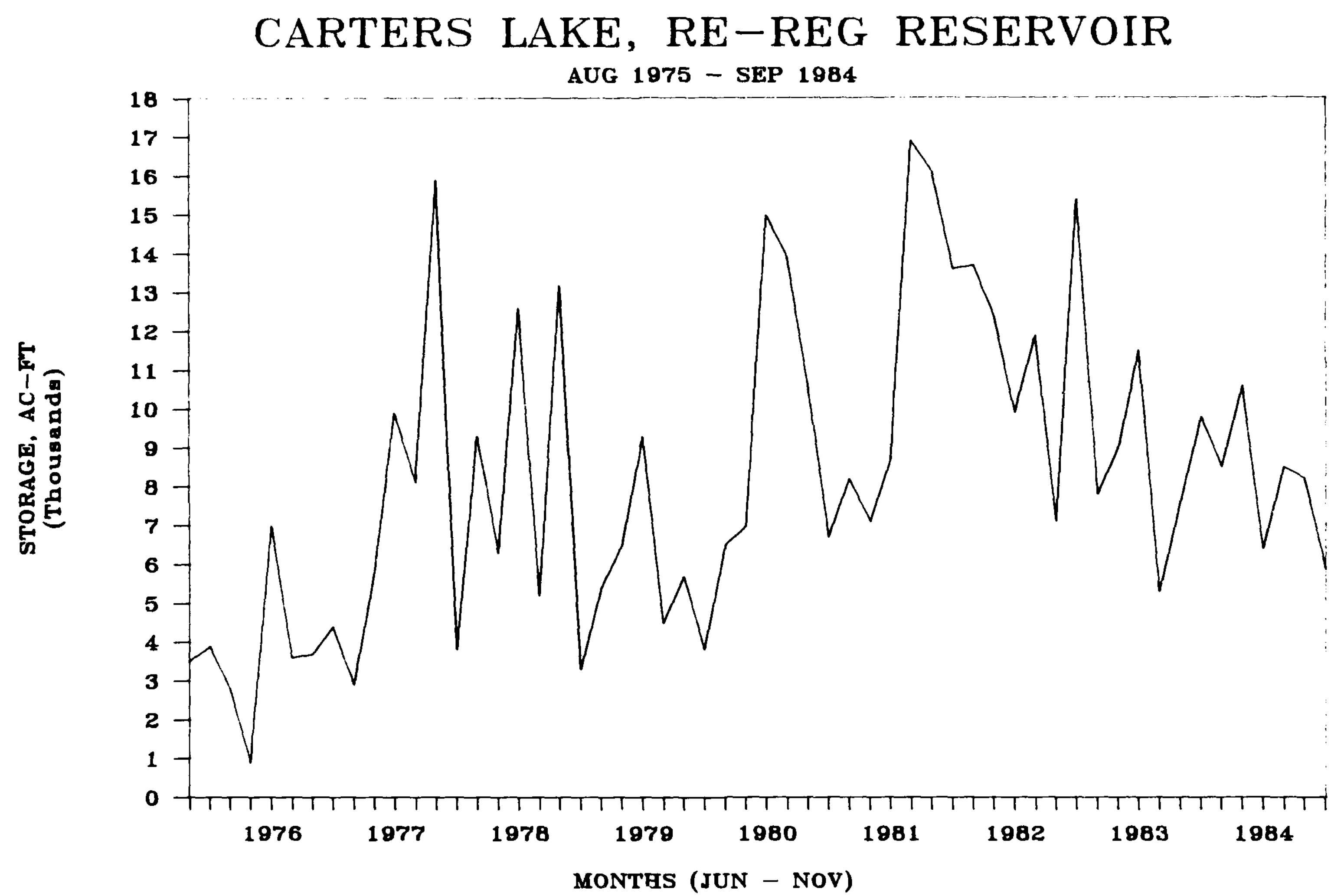

CARTERS LAKE, RE-REG RESERVOIR
AUG 1975 - SEP 1984
STORAGE, AC-FT
(Thousands)
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
1976
1977
1978
1979
1980
1981
1982
1983
1984
MONTHS (JUN - NOV)

FIGURE H-4

DAILY FLOW–DURATION, 1898–1972

STATION 02382500 CARTERS

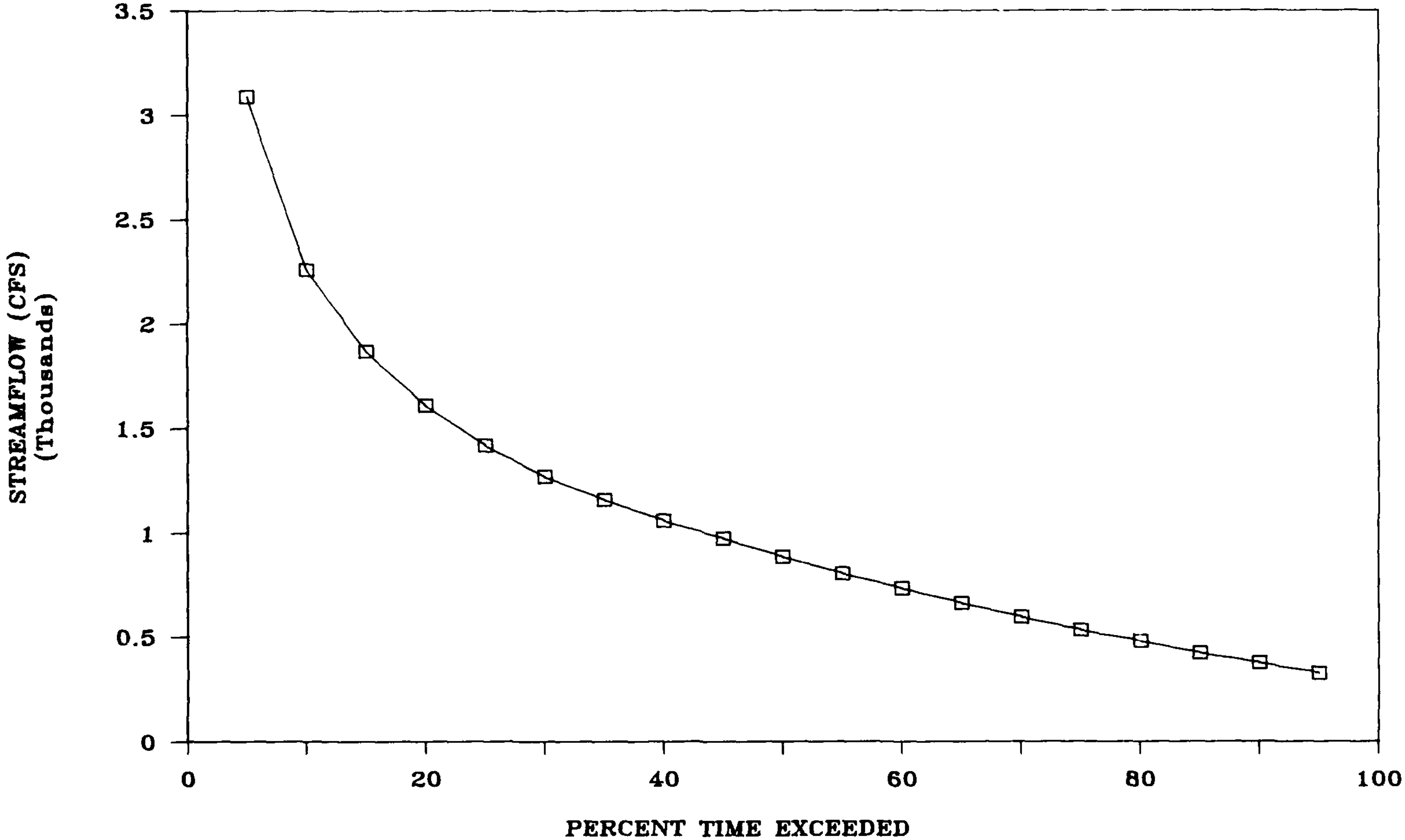


FIGURE H-5

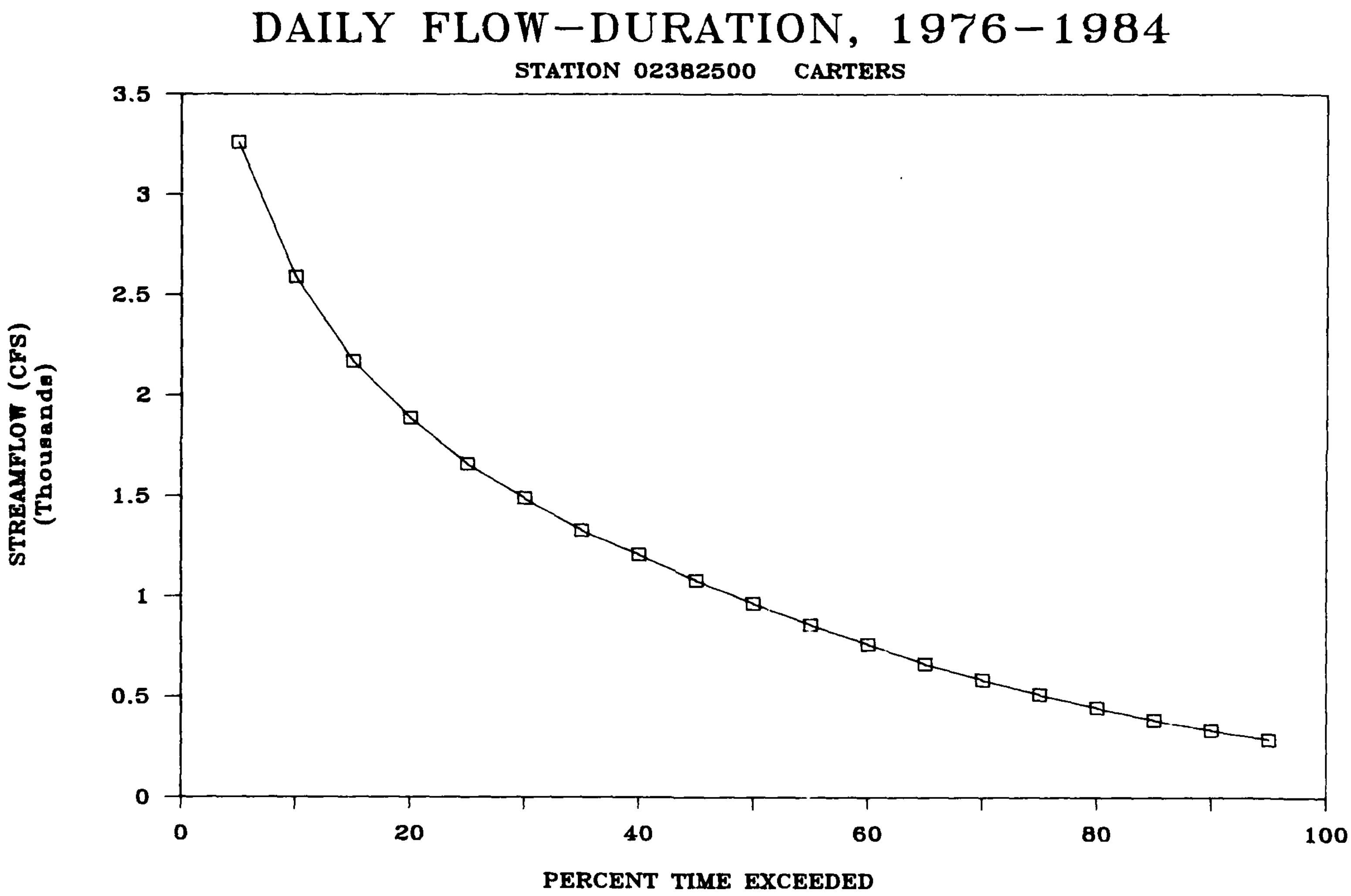

DAILY FLOW–DURATION, 1976–1984
STATION 02382500 CARTERS
STREAMFLOW (CFS)
(Thousands)
3.5
3
2.5
2
1.5
1
0.5
0
0
20
40
60
80
100
PERCENT TIME EXCEEDED

FIGURE H-6

DAILY FLOW–DURATION

STATION 02382500 CARTERS

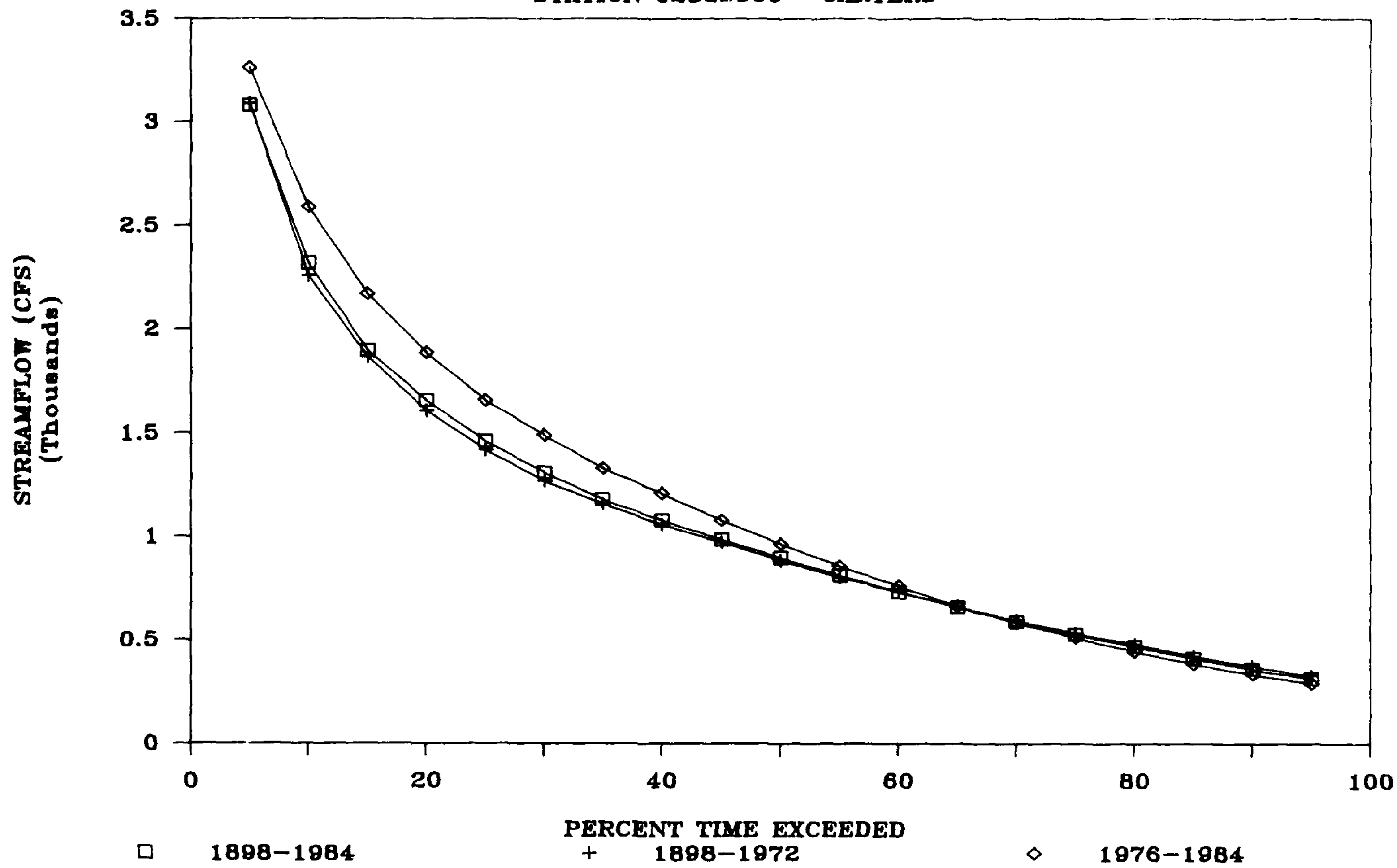
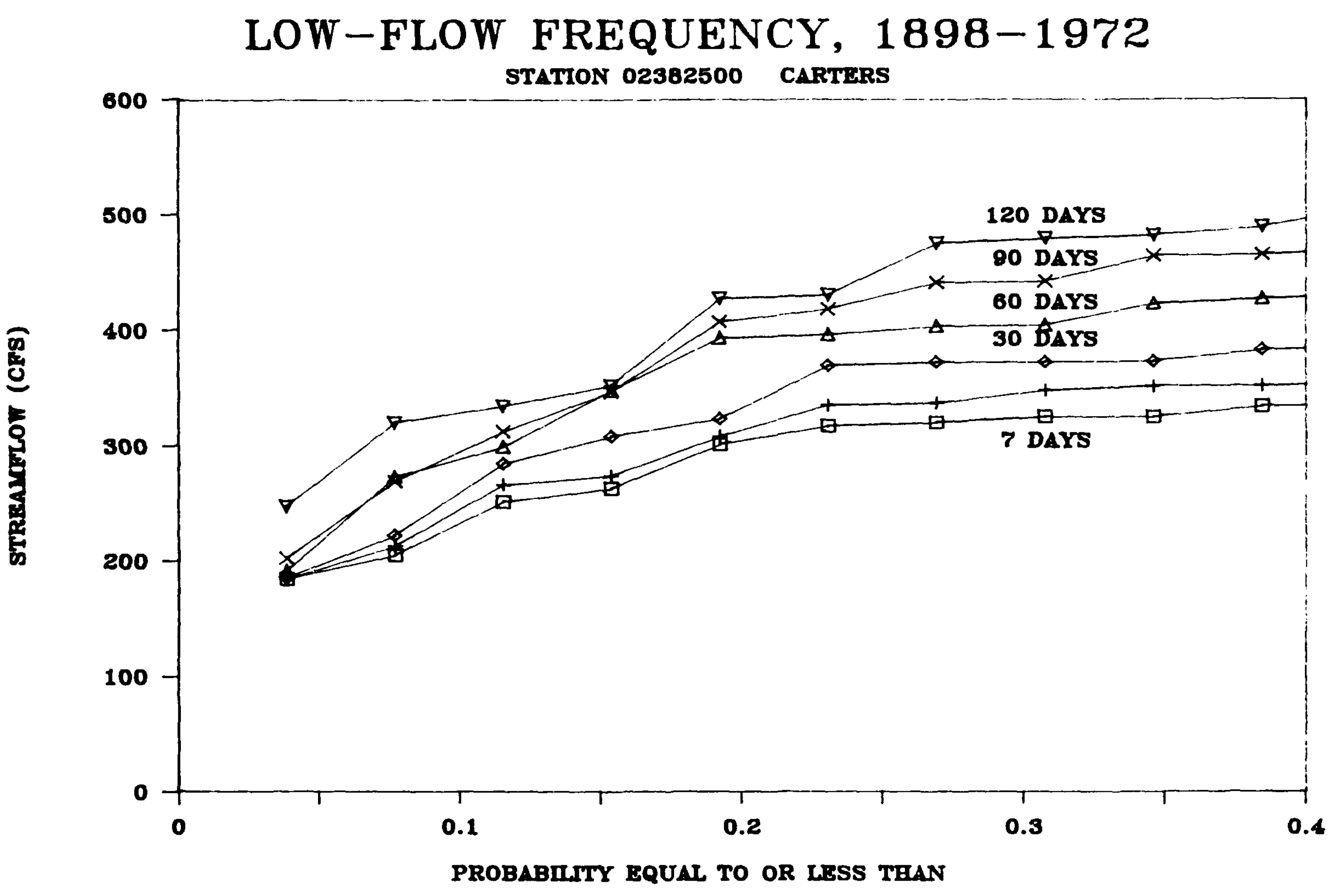


FIGURE H-7



LOW-FLOW FREQUENCY, 1898-1972
STATION 02382500 CARTERS
STREAMFLOW (CFS)
PROBABILITY EQUAL TO OR LESS THAN
120 DAYS
90 DAYS
60 DAYS
30 DAYS
7 DAYS
0
100
200
300
400
500
600
0.1
0.2
0.3
0.4

FIGURE H-8

LOW-FLOW FREQUENCY, 1976-1984

STATION 02382500 CARTERS

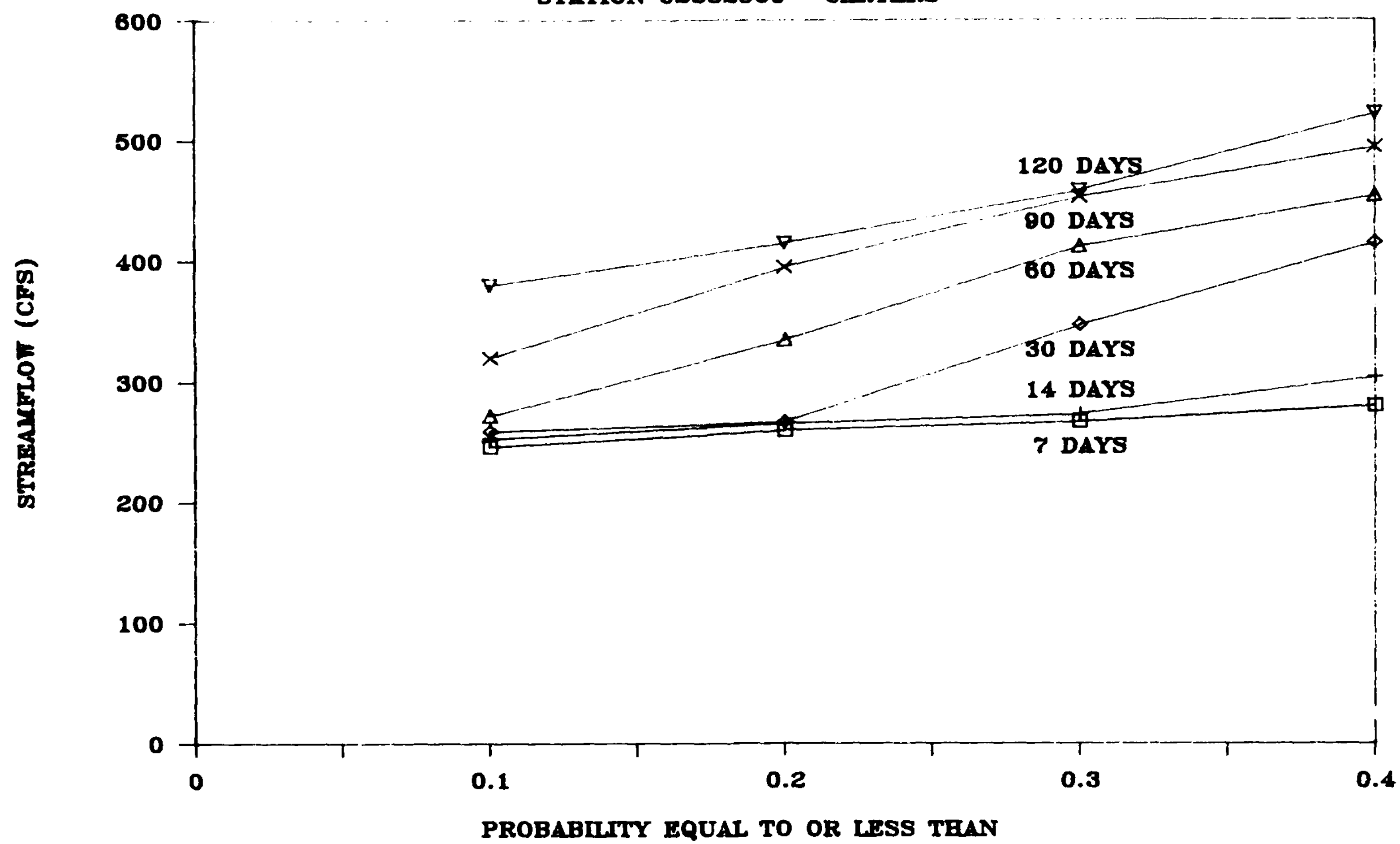


FIGURE H-9

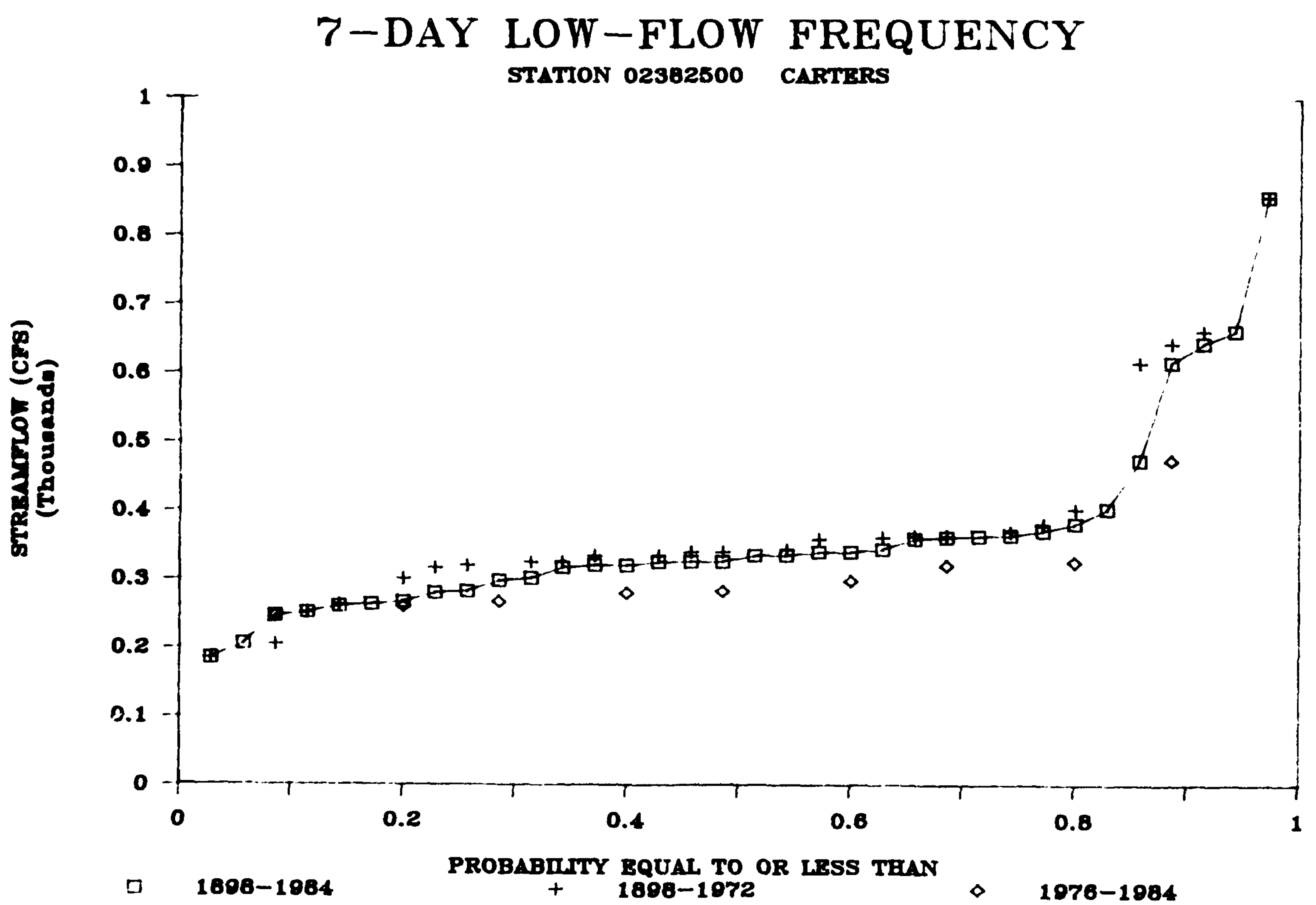

7-DAY LOW-FLOW FREQUENCY
STATION 02382500 CARTERS
STREAMFLOW (CFS)
(Thousands)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
0.2
0.4
0.6
0.8
1
PROBABILITY EQUAL TO OR LESS THAN
1898-1984
1898-1972
1976-1984

FIGURE H-10

STOCHASTIC ANALYSIS, STATION 02382500

1000 YEARS OF SYNTHETIC FLOWS

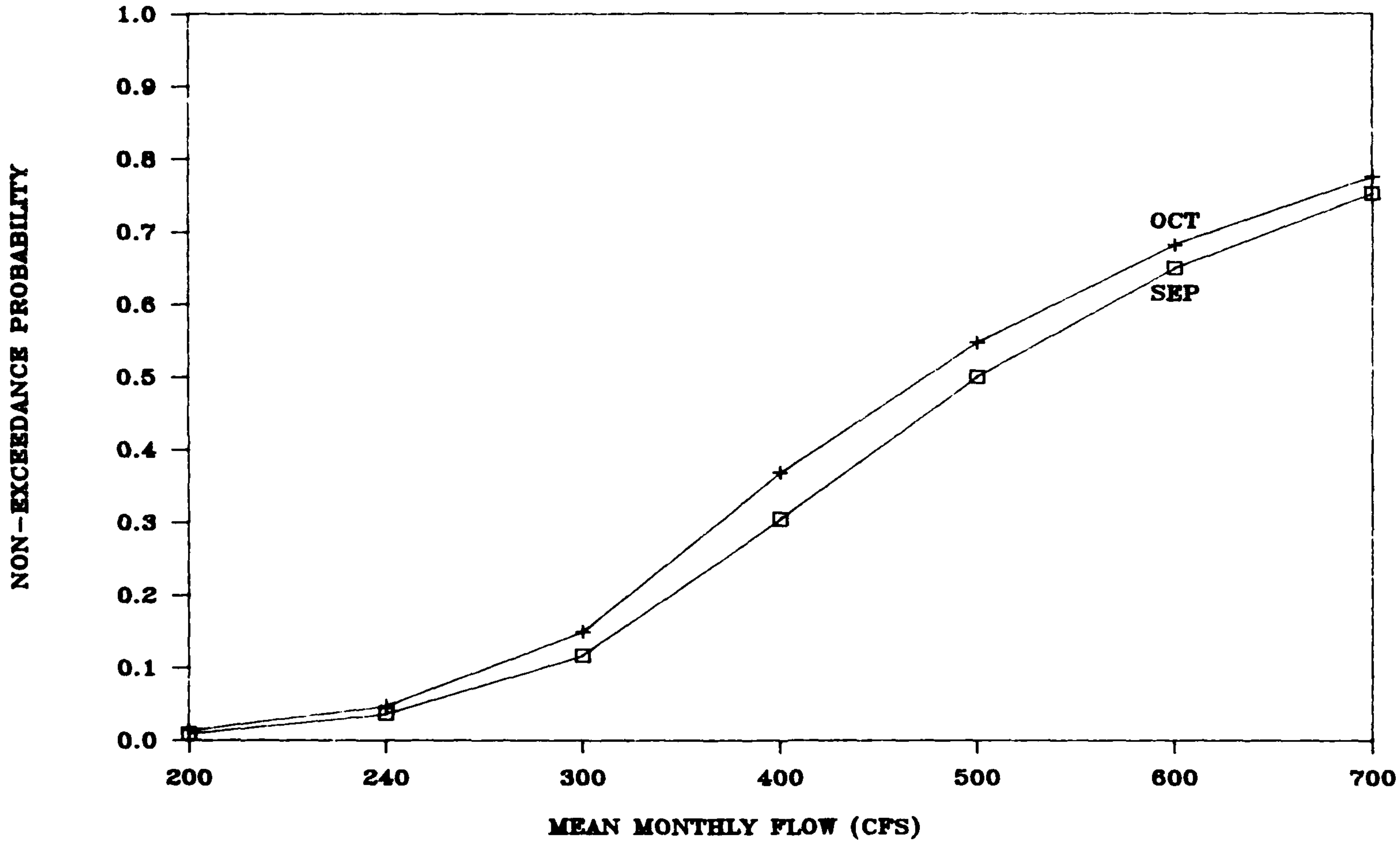


FIGURE H-11

7-DAY LOW-FLOW FREQUENCY

STATION 02387500 RESACA

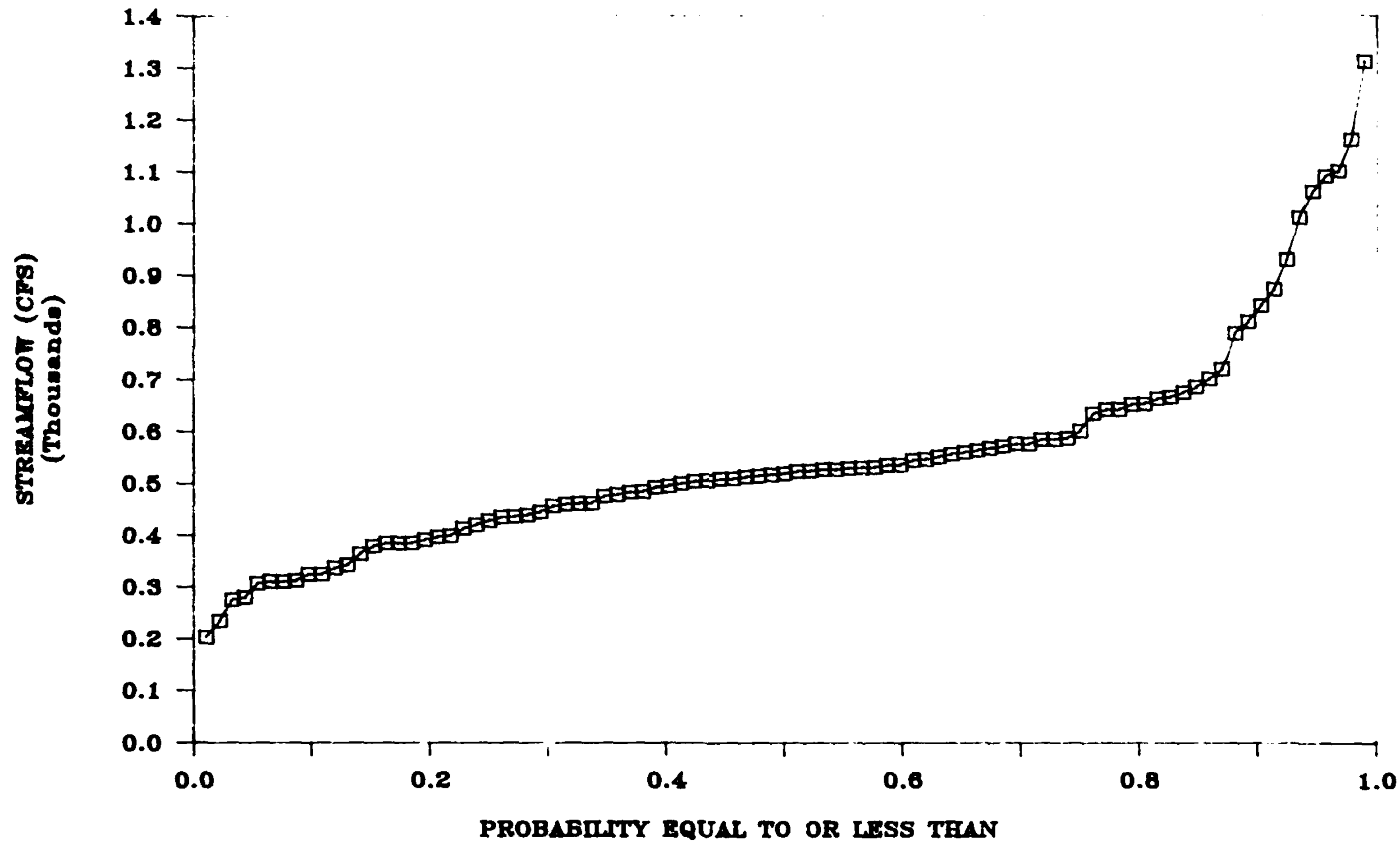
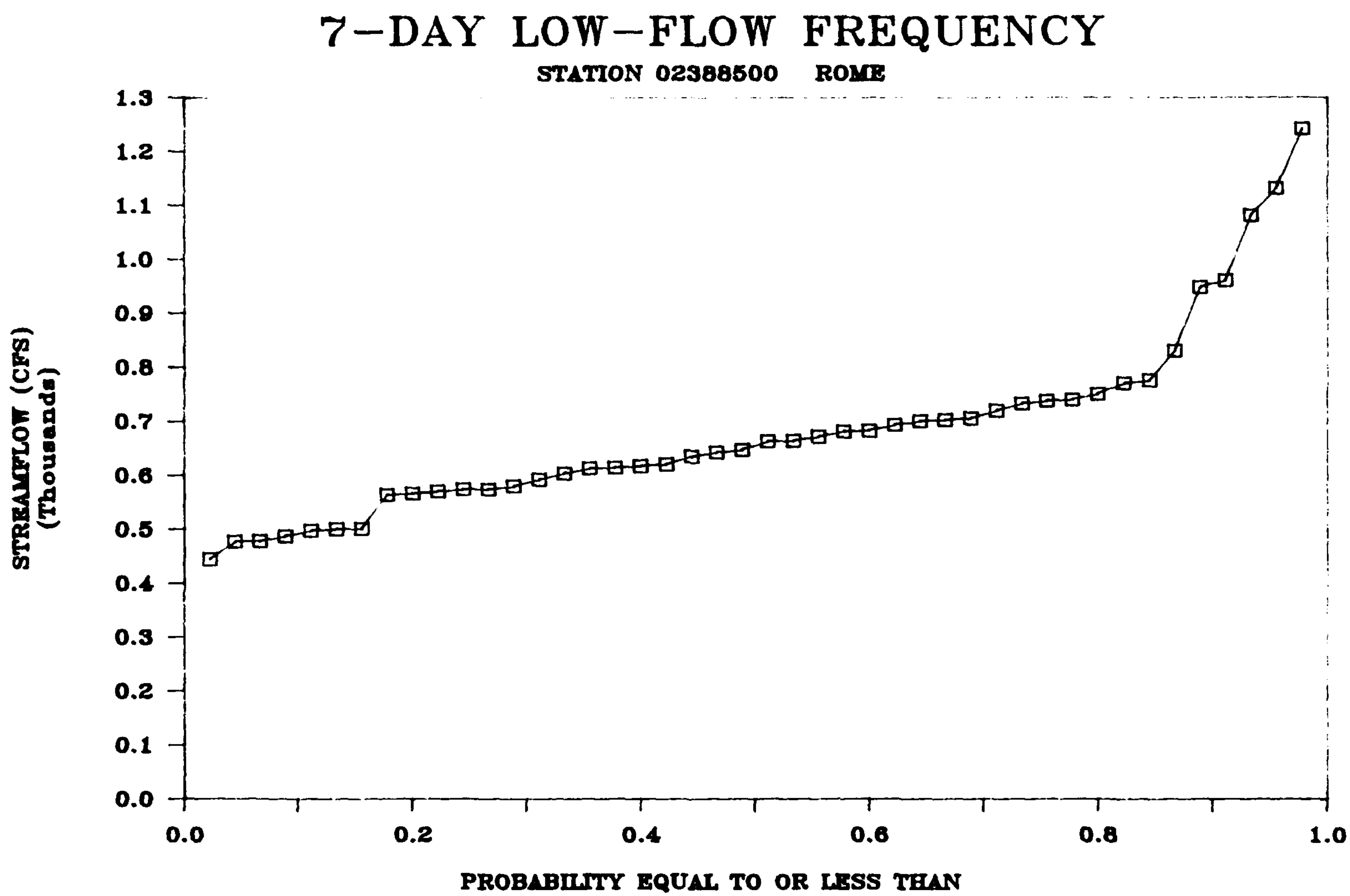


FIGURE H-12



7-DAY LOW-FLOW FREQUENCY
STATION 02388500 ROME
STREAMFLOW (CFS)
(Thousands)
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.0
0.2
0.4
0.6
0.8
1.0
PROBABILITY EQUAL TO OR LESS THAN

FIGURE H-13